

Disclaimer

Because of the variety of uses for SICAR described in this publication, those responsible for the use of SICAR must satisfy themselves that all necessary steps have been taken to assure that each use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation Siemens does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

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Introduction

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1. Short description

SICAR provides an efficient automation concept for sequence controls.

The benefit of using **SICAR** is that it consists of exactly coordinated HMI and PLC-software.

This saves the user from dealing with how to build up a functioning program, out of varying products and software blocks. Programming a plant specific control program can be approached immediately.

A unit philosophy of operating and diagnosis means a great benefit for plants operating with **SICAR**. Though different plants and different vendors, which enables maintenance staff to find out errors more quickly and solve them efficiently.

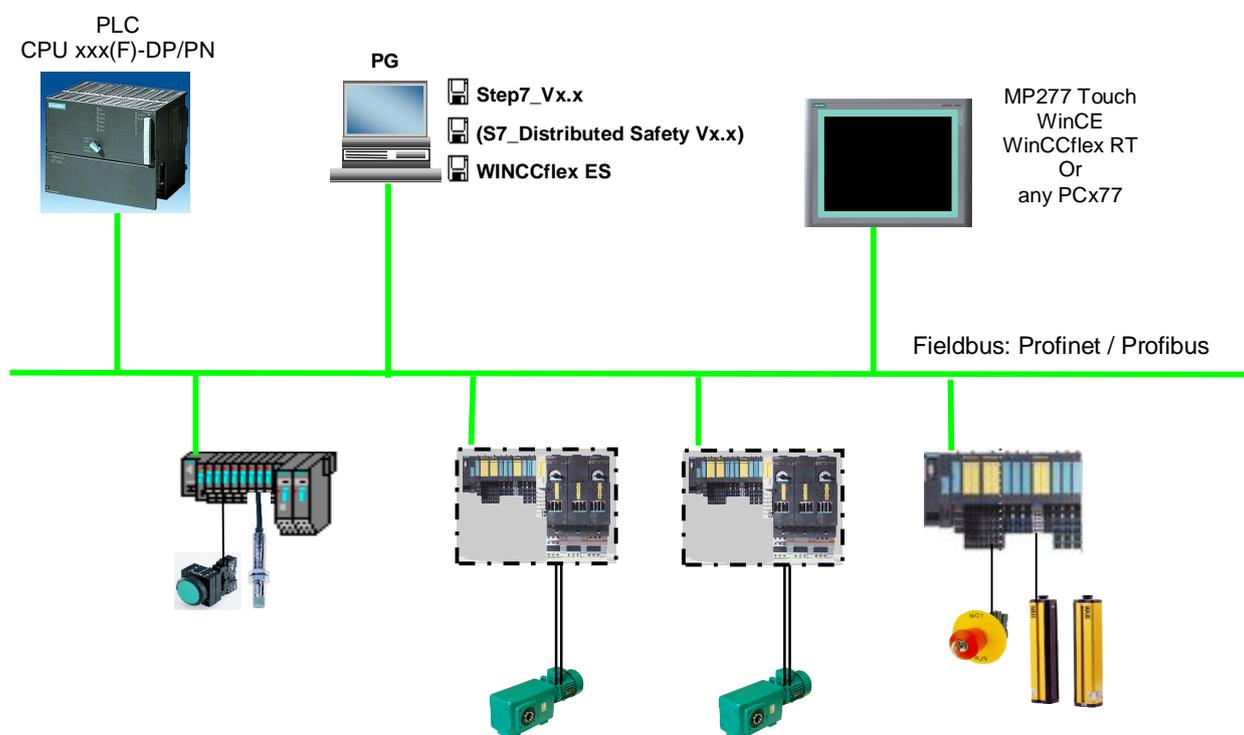
If any modifications or any extension should be necessary on the program, the PLC-basic software structure guarantees quick working with the control programmes of different plants and vendors.

1.1 Survey

SICAR consists of the following software packages

- SICAR_HMI (Software for HMI)
- SICAR_PLC (Control program for SIMATIC S7)

1.1.1 Configuration survey SICAR



1.2 Software package SICAR

The software package **SICAR** is the visualization-software for the operator panel, harmonising with SICAR_PLC software package for SIMATIC S7. This deals about screen masks for e.g. Fieldbus diagnosis, Tec-Unit diagnosis, Operating mode screen up to sequence diagnosis and movements screen. The plant vendor has to complete these screen masks system-specificly.

1.2.1 Software package SICAR_PLC

The software package SICAR_PLC is a complete, structured and functional program based on SIMATIC S7, with the functions:

- tec-Units
- sequence control
- manual operation
- diagnosis
- operation-modes
- interface to the operator panel
- production data
- system resources
-

The plant vendor designs the plant specific structure supported by tec-unit blocks and the sequence control.

Tec-Unit block

A tec-unit block controls a technological unit, like a lifter, roller bed, valve, etc.

Parameters like Enable signals, Interlocks, operating mode signals, Timer to control the movements, Pushbutton signals for manual movements, etc. must be assigned.

The block provides the according output parameters like advance, return, fast, slow, etc.

Also two interfaces, Visu and Alarms, are integrated, one for ready prepared faceplates in WINCCflex and according diagscreens and the second one for discrete alarms in WINCCflex.

Sequence block

The sequence block coordinate the control of the tec-unit blocks and covers these functions:

- sequence control management of 128 sequences in parallel, with up to 128 steps per block
- management of the operation modes: automatic and inching mode
- synchronising the sequence block to the actual condition/status of the machine
- organising and supervising the functional sequence for automatic mode

The programmed sequence blocks are shown automatically by a diagnosis-screen on the HMI.

Diagnosis

The sequence block monitors the actual sequence in

- Automatic mode interlock automatic = **1** and Transition automatic = **0**
and watchdog time expired

Manual operation

The Tec-unit block allows a controlled manual operation via an movement picture. In this operation mode, the concerned logical operations of interlock conditions and limit switch control are present.

Using the movement buttons on the left and right of the display, the momentary sequence can be quitted and any other movement can be executed. This function can be used even without a diagnosis.

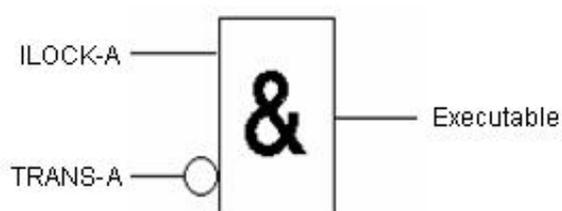
When changing from manual to automatic mode, it is possible to continue the automatic operation immediately by using the function synchronisation.

Synchronisation

To carry out a synchronisation, the sequence block provides the possibility to analyse either one selected or all sequences if a key is pressed in operation mode 'off'.

All steps of a sequence are analysed whether they are executable in automatic mode.

A step is executable if interlock automatic = **1**, and transition condition automatic = **0**.



If a sequence step is executable unequivocally, the sequence is set to this step (**synchronized**).

By switching to automatic mode, the automatic sequence is continued immediately.

1.2.2 Software package SICAR_HMI

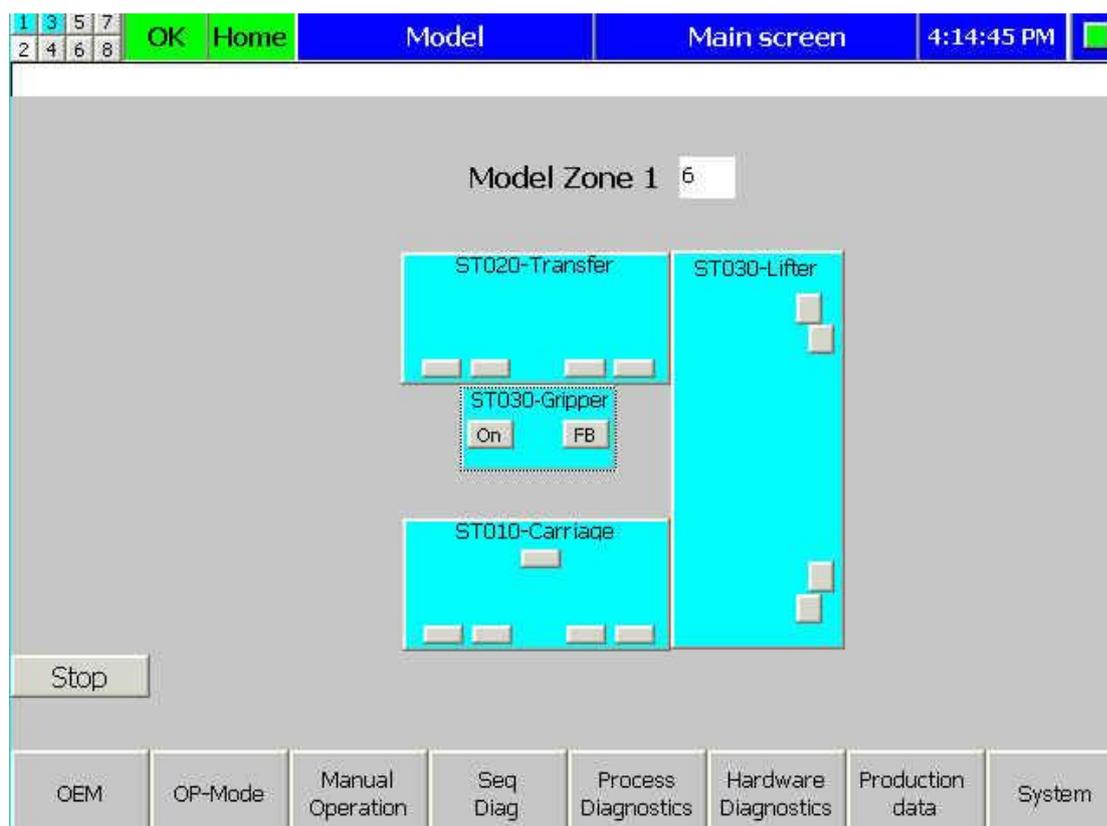
The software package SICAR_HMI is a WINCCflexible project with the functions:

- tec-unit faceplates, diagscreens, prepared binary messages
- sequence diag screen
- manual movement sceens
- Profinet and Profibus diagnosis
- operation-mode screen
- interface to the operator panel
- production data
- Interface screens drives, RFID,
-

The plant vendor designs the plant specific structure supported by these screens.

Attached the screen masks for plant overview, Tec-Unit diagnosis, movements and sequence diagnosis.

Plant overview:



Tec-unit detail diagnosis:

208 ST010-Carr Time monitoring advance	
Detail information FB370 PosDev_2S2D2P_PC	
Limit switch advance	Fault Group message
Limit fast/slow advance	Fault Motor temperature
Limit fast/slow return	Fault Motor protection
Limit switch return	Fault Enable fault
Automatic mode	Fault Limit switch check
Manual mode	Fault Limit switch check fast/slow
Locking conditions advance	Fault Interlock error advance
Locking conditions return	Fault Interlock error return
Enable advance in automatic mode	Fault Time monitoring advance
Enable return in automatic mode	Fault Time monitoring return
Output fast	Fault Limit position advance left w/o signal
Output slow	Fault Limit position return left w/o signal
Output advance	Fault Limit position advance not left w signal
Output return	Fault Limit position return not left w signal
Part on position device	Fault Part missing

Movement screens:

The screenshot shows the 'Manual Movement' screen with a top bar containing 'Model', 'Manual Movement', and '6:18:21 PM'. Below the bar are four movement profiles, each with 'Advance' and 'Return' buttons and a central status bar:

- Profile 1: ST010_Carriage FAST. Advance: -S54_FS_ADV, Return: -S55_FS_RTN.
- Profile 2: ST010_Carriage SLOW. Advance: -S53_LS_ADV, Return: -S56_LS_RTN.
- Profile 3: ST020_Trans FAST. Advance: -S43_FS_ADV, Return: -S40_FS_RTN.
- Profile 4: ST020_Trans SLOW. Advance: -S42_LS_ADV, Return: -S41_LS_RTN.

At the bottom, there is a navigation bar with buttons: Special Overview, User Overview_1, Manual Overview_1, Symbol / Absolute, Process Diagnostics, -, +, and Main Menu. A page indicator shows 'Page 1 of 20'.

Sequence diagnosis:

The screenshot shows the 'Seq_Diag' screen with a top bar containing 'Model', 'Seq_Diag', and '1:32:51 PM'. The main area is divided into a sequence list and a detailed description of the selected step.

Sequence / Messageblock	Step	Sync
1 Zone 1 messages		
4 ST010_ST020_ST030	5	

The detailed description for the selected step (Step 5) includes:

- Initial position
- Lifter Moving Down, No Part Present
- Lifter In Down Position
- Gripper On Dwell Time
- Lifter Moving Up, Part Present** (highlighted)
- Trans/Carr Advancing, Part Pres Gripper
- Lifter Moving Down, Part Present
- Lifter In Down Position
- Gripper Off Dwell Time
- Lifter Moving Up, No Part Present
- Trans/Carr Returning, Part Pres Carriage

Navigation buttons on the right include LOCK, Sync-S, Sync-A, Inch-S, and Inch-A. The bottom bar contains: Alarm, Alarm History, Manual Operation, Cursor to right, Line Up, Page Up, Line Dn, Page Dn, and Main Menu.

2. Software requirements

- **Simatic Step7 V5.5 SP2 or higher**
- **WinCC flexible 2008 SP3 Upd x**
- **S7 Distributed Safety V5.4 SP5**
- **S7 ConfigurationPack V5.5 SP8**

3. Content of the SICAR-CD

3.1 SICAR_basic

The file "SICAR_BASIC_V1_x_PLC.zip" contains a PLC-programm only with basic functions, the file "SICAR_Basis_V1.x_HMI" a basic WINCCflex project.

3.2 SICAR_demo

Based on our Demo kit the file "SICAR_DEMO_V1_x_PLC.zip" contains a PLC-programm and the file "SICAR_DEMO_V1.x_HMI" a WINCCflex project.

The demo kit consists of:

PLC317F-PN/DP -> Password of the F-Programm: "Passwort"

MP277 10" Touch

3 axis model with ET200M Profinet

Safety modules ET200S Profinet

3.3 SICAR_lib



SICAR lib is a S7-library and consists of Basic_functions, Tec-unit blocks, HMI_interface and Sequence control incl. operation modes.

3.4 Documentation

In chapter 3 Software all SICAR functions are explained.

30_Hard- and Software intro

31_Initialization and Operation modes

32_HMI and Systemdiagnostics

33_Technological units

34_Sequence control and diagnostics

35_Safety

The document in chapter 4 "04_User_Guideline" should be a guideline for the projection engineer how to build up a project by using the software components discribed in chapter 3 "Software".

4. Software structure OB1

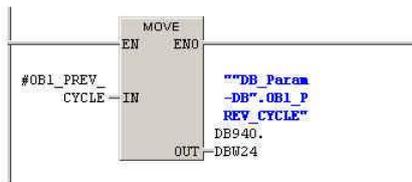
57-Programm						
OB1 [maximal: 248+40]	[32]					
DB940 (DB_Param-DB)	[32]	KOP	NW	1		
FC981 (FC_INIT)	[46]	KOP	NW	2		
FC983 (FC_Call Operation modes)	[110]	KOP	NW	3		
FC986 (FC_Call Seq/message)	[34]	KOP	NW	4		
FB943 (FB_IF_Detail_Diag_HMI), DB951 (IDB_...	[96]	KOP	NW	5		
FC67 (FC_HMI_MANAG)	[70]	KOP	NW	6		
FC151 (FC_HMI_PRODUCTIONDAT)	[42]	KOP	NW	7		
FB126 (FB_PNIO_DIAG), DB126 (IDB_PNIO_DI...	[114]	KOP	NW	8		
FC984 (FC_Call_user_blocks)	[32]	KOP	NW	9		
FC989 (FC_Last FC)	[44]	KOP	NW	10		
FB49 (SFM_FB), DB49 (SFM_DB)	[32]	AWL	NW	11	Anw	1

OB1 : "Main Program Sweep (Cycle)"

Kommentar:

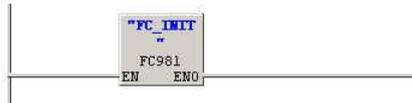
Netzwerk 1: Titel:

Title_english Current cycle time of PLC for Visu
 Title_deutsch Aktuelle Zykluszeit der SPS für Visu



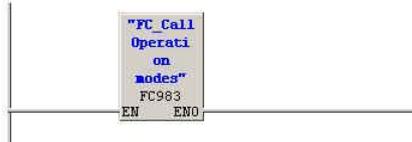
Netzwerk 2: Titel:

Title_english Call first FC
 Title_deutsch Aufruf erster Baustein



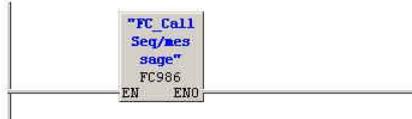
Netzwerk 3: Titel:

Title_english Call operation modes
 Title_deutsch Aufruf Betriebsarten



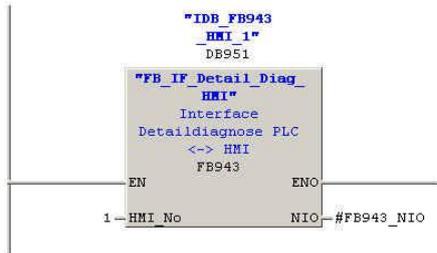
Netzwerk 4: Titel:

Title_english Call Sequence/message blocks
 Title_deutsch Aufruf Ablauf-/Meldebausteine



Netzwerk 5: call sequence detail diagnostic engine

Additional to Basis diagnostics
for logic detail view and logic detail analysis



Netzwerk 6: HMI LITE manage

Title_english Call HMI MANAGE
Title_deutsch Aufruf HMI MANAGE



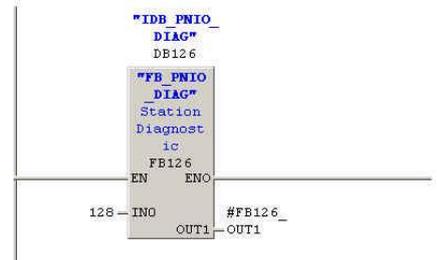
Netzwerk 7: Titel:

Title_english Call HMI productiondata
Title_deutsch Aufruf HMI Produktionsdaten



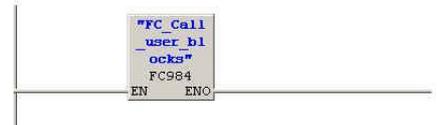
Netzwerk 8: HMI PNIO Diagnostic

Title_english Call HMI Station Diagnostic
Title_deutsch Aufruf HMI_Station Diagnostic



Netzwerk 9: Titel:

Title_english Call user blocks
Title_deutsch Aufruf Anwender Baustein



Netzwerk 10: Last FC

Kommentar:



Netzwerk 11: Call report System Error Block

Kommentar:

CALL FB 49, DB49 SFM_FB / SFM_DB -- Diagnostic bl

Initialization

[-] <input type="checkbox"/>	FC981 (FC_INIT)	[46]	KOP	NW	2
[-] <input type="checkbox"/>	FC999 (FC_Initialization)	[192]	KOP	NW	3
[-] <input type="checkbox"/>	DB990 (DB_SYSTEM)	[46]	KOP	NW	4
[-] <input type="checkbox"/>	FB981 (FB_USER_IF_OM), DB1000 (DB_U...)	[46]	KOP	NW	7
[-] <input type="checkbox"/>	FB300 (Control_Voltage_On), DB300 (DB_...)	[46]	KOP	NW	8

Operation modes and auto sync

[-] <input type="checkbox"/>	FC983 (FC_Call Operation modes)	[110]	KOP	NW	3
[-] <input type="checkbox"/>	FC997 (FC_Panel_2)	[240]	KOP	NW	1
[-] <input type="checkbox"/>	FC995 (FC_operation_modes_zone)	[224]	KOP	NW	2
[-] <input type="checkbox"/>	FC941 (FC_Init_Panel)	[228]	KOP	NW	3
[-] <input type="checkbox"/>	FC974 (FC_Auto Synchronize)	[136]	KOP	NW	4

Sequence engine, Tec-units, Interface block drives, preparation of HMI-information

[-] <input type="checkbox"/>	FC986 (FC_Call Seq/message)	[34]	KOP	NW	4
[-] <input type="checkbox"/>	FC1001 (FC_Zone1_messages)	[40]	KOP	NW	1
[-] <input type="checkbox"/>	FB1001 (FB_Zone1_messages), DB1001 (IDB_ZONE_1_messages)	[42]	KOP	NW	1
[-] <input type="checkbox"/>	FC1000 (FC_Analysis_messages)	[78]	KOP	NW	2
[-] <input type="checkbox"/>	FC1004 (FC_ST010_carriage)	[44]	KOP	NW	2
[-] <input type="checkbox"/>	FC992 (FC_Movements_extern)	[54]	KOP	NW	1
[-] <input type="checkbox"/>	FC992 (FC_Movements_extern)	[54]	KOP	NW	2
[-] <input type="checkbox"/>	FB1000 (FB_SEQUENCE), DB1004 (IDB_SEQ_ST010_carriage)	[68]	KOP	NW	3
[-] <input type="checkbox"/>	FB370 (PosDev_2D252P_PC), DB401 (IDB_ST010_carriage)	[52]	KOP	NW	4
[-] <input type="checkbox"/>	DB110 (DB_INTERFACE_TEC_VISU)	[44]	KOP	NW	4
[-] <input type="checkbox"/>	DB119 (DB_INTERFACE_TEC_ALARMS)	[44]	KOP	NW	4
[-] <input type="checkbox"/>	DB1004 (IDB_SEQ_ST010_carriage)	[44]	KOP	NW	4
[-] <input type="checkbox"/>	FC1005 (FC_ST020_transfer)	[44]	KOP	NW	3
[-] <input type="checkbox"/>	FC992 (FC_Movements_extern)	[54]	KOP	NW	1
[-] <input type="checkbox"/>	FC992 (FC_Movements_extern)	[54]	KOP	NW	2
[-] <input type="checkbox"/>	FB1000 (FB_SEQUENCE), DB1005 (IDB_SEQ_ST020_transfer)	[68]	KOP	NW	3
[-] <input type="checkbox"/>	FB369 (PosDev_2D252P), DB402 (IDB_ST020_transfer)	[52]	KOP	NW	4
[-] <input type="checkbox"/>	DB119 (DB_INTERFACE_TEC_ALARMS)	[44]	KOP	NW	4
[-] <input type="checkbox"/>	DB1005 (IDB_SEQ_ST020_transfer)	[44]	KOP	NW	4
[-] <input type="checkbox"/>	DB110 (DB_INTERFACE_TEC_VISU)	[44]	KOP	NW	4
[-] <input type="checkbox"/>	FC1006 (FC_ST030_lifter_grip)	[44]	KOP	NW	4
[-] <input type="checkbox"/>	FC992 (FC_Movements_extern)	[54]	KOP	NW	1
[-] <input type="checkbox"/>	FC992 (FC_Movements_extern)	[54]	KOP	NW	2
[-] <input type="checkbox"/>	FC992 (FC_Movements_extern)	[54]	KOP	NW	3
[-] <input type="checkbox"/>	FC992 (FC_Movements_extern)	[54]	KOP	NW	4
[-] <input type="checkbox"/>	FB1000 (FB_SEQUENCE), DB1006 (IDB_SE_ST030_lifter_grip)	[68]	KOP	NW	5
[-] <input type="checkbox"/>	FB332 (Lifter_252D2P), DB403 (IDB_ST030_lifter)	[52]	KOP	NW	6
[-] <input type="checkbox"/>	DB110 (DB_INTERFACE_TEC_VISU)	[44]	KOP	NW	6
[-] <input type="checkbox"/>	DB119 (DB_INTERFACE_TEC_ALARMS)	[44]	KOP	NW	6
[-] <input type="checkbox"/>	DB1006 (IDB_SE_ST030_lifter_grip)	[44]	KOP	NW	6
[-] <input type="checkbox"/>	FB382 (Device On Off FB), DB404 (IDB ST030 gripper)	[56]	KOP	NW	7

Interface Detail Diagnosis

[-] <input type="checkbox"/>	FB943 (FB_IF_Detail_Diag_HMI), DB951 (IDB_FB943_HMI_1)	[96]	KOP	NW	5
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Basic screens

<input type="checkbox"/>	FC67 (FC_HMI_MANAG)	[70]	KOP	NW	6
<input type="checkbox"/>	FC68 (FC_HMI_BASIC)	[100]	KOP	NW	1
<input type="checkbox"/>	FC61 (FC_HMI_1_SCREEN_MANUAL)	[72]	KOP	NW	2
<input type="checkbox"/>	FC62 (FC_HMI_1_SCREEN_USER_OP)	[72]	KOP	NW	3
<input type="checkbox"/>	FC63 (FC_HMI_1_SPEC_FUNCTION)	[72]	KOP	NW	4
<input type="checkbox"/>	FC69 (FC_HMI_MANUAL)	[118]	KOP	NW	5
<input type="checkbox"/>	FC106 (FC_HMI_RF300)	[90]	KOP	NW	8
<input type="checkbox"/>	FC200 (FC_RFID_DATA)	[112]	KOP	NW	9
<input type="checkbox"/>	FB45 (FB_MOBY_RF180C), DB203 (IDB_RF180C_1)	[176]	KOP	NW	10
<input type="checkbox"/>	DB67 (DB_HMI_1_DATA)	[70]	KOP	NW	12

Production data

<input type="checkbox"/>	FC151 (FC_HMI_PRODUCTIONDAT)	[42]	KOP	NW	7
<input type="checkbox"/>	FC920 (FC_Prod_data_Visu)	[90]	KOP	NW	1
<input type="checkbox"/>	FB982 (USER_IF_PRODUCTION_DATA), DB996 (IDB_PRODUCTION_DATA)	[42]	KOP	NW	2
<input type="checkbox"/>	FB997 (PRODUCTION_DATA)	[138]	KOP	NW	3

Fieldbus diagnosis, User blocks, Last FC and RSE

<input type="checkbox"/>	FB126 (FB_PNIO_DIAG), DB126 (IDB_PNIO_DIAG)	[114]	KOP	NW	8		
<input type="checkbox"/>	FC984 (FC_Call_user_blocks)	[32]	KOP	NW	9		
<input type="checkbox"/>	FC989 (FC_Last FC)	[44]	KOP	NW	10		
<input type="checkbox"/>	FB49 (SFM_FB), DB49 (SFM_DB)	[32]	AWL	NW	11	Anw	1

5. System resources

This chapter contains the definitions of the system resources of SICAR for

- Function (FC)
- Functionblocks (FB)
- Datablocks (DB)
- UDT
- Marker

Function	Number Range				
Blocks	FB	FC	DB	UDT	Mem. bytes
System Library: HMI-Interface and System-Diagnostics	0-159	0-159	0-199	0-199	0-100
Distributed Safety Library:	160-239	160-199	--	--	--
User: Section 1	240-299	200-299	200-299	--	100-499
System Library Siemens: Technological -Units for Body & Assembly and conveyors	300-399	300-399		--	2000-2048
Customer Library User: Technological -Units for Body & Assembly and conveyors	400-499	400-499	300-499	--	2000-2048
User: Section 2 for Safety program	500-599	500-599	500-599	--	500-600
System Library: Safety Program	600-799	--	600-799	--	
User: Section 3	800-899	600-899	800-899		600-999
System Library: Initialization and Sequence_Engine incl. Process- Diagnostics	900-1299	900-1299	900-1299	900-999	
User Section 4	1300...	1300...	1300...		1300-1999

A detailed description can be found in the respective chapters.