INDUSTRY PROCESS
AND AUTOMATION SOLUTIONS

BONFIGLIOLI VECTRON

Application manual - Function table

ACTIVE Cube

GB

BONFIGLIOLI

General Information about the Documentation

This application manual complements the operating instructions and the „Quick Start Guide“ of the ACU frequency inverters (ACTIVE Cube series). This application manual contains all relevant information required for using the function table.

For better clarity, the documentation is structured according to the customer-specific requirements made on the frequency inverter.

Quick Start Guide
The Quick Start Guide describes the basic steps required for mechanical and electrical installation of the frequency inverter. The guided commissioning supports you in the selection of necessary parameters and the software configuration of the frequency inverter.

Operating Instructions
The Operating Instructions describe and document all functions of the frequency inverter. The parameters required for adapting the frequency inverter to specific applications as well as the wide range of additional functions are described in detail.

Application Manual
The application manual supplements the documentation for purposeful installation and commissioning of the frequency inverter. Information on various subjects connected with the use of the frequency inverter are described specific to the application.

Installation Instructions
Complementing the Brief Instructions and the Operating Instructions, the Installation Instructions provide information on how to install and use the additional/optional components.

If you need a copy of the documentation or additional information, contact your local representative of BONFIGLIOLI .

The following pictograms and signal words are used in the documentation:

Danger!
Danger refers to an immediate threat. Non-compliance with the precaution described may result in death, serious injury or material damage.

Warning!
Warning refers to a possible threat. Non-compliance with the warning may result in death, serious injury or material damage.

Caution!
Caution refers to an immediate hazard. Non-compliance may result in personal or material damage.

Attention!
Attention and the related text refer to a possible behavior or an undesired condition which can occur during operation.

Note
marks information which facilitates handling for you and supplements the corresponding part of the documentation.

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1 General Safety Instructions and Information on Use

Warning! The specifications and instructions contained in the documentation must be complied with strictly during installation and commissioning. Only qualified staff who has read the documentation and, in particular, the safety instructions carefully is allowed to carry out installation or commissioning work or to operate the frequency inverters. The term „Qualified Staff“ refers to anybody who is familiar with the installation, assembly, commissioning and operation of the frequency inverter and has the proper qualification for the job.

The present documentation was prepared with great care and it was subjected to extensive and repeated reviews. For reasons of clarity, it was not possible to include all details of all types of the product in the documentation. Neither was it possible to consider all conceivable installation, operation or maintenance situations. If you require further information or if you meet with specific problems which are not dealt with in sufficient detail in the documentation, contact your national BONFIGLIOLI agent.
We would also like to point out that the contents of this documentation do not form part of any previous or existing agreement, assurance or legal relationship. Neither are they intended to supplement or replace such agreements, assurances or legal relationships. The manufacturer's obligations are exclusively specified in the relevant purchase contract. This contract also contains all and any warranty regulations which may apply to the relevant scope of supply. These contractual warranty provisions are neither extended nor limited by the specifications contained in this documentation.
The manufacturer reserves the right to correct or amend the specifications, product information and omissions in these operating instructions without notice. The manufacturer shall not be liable for any damage, injuries or costs which may be caused by the aforementioned reasons.

1.1 General Information

Warning! The DC-link circuit of the frequency inverter is charged during operation, i.e. there is always the risk of contact with high voltage. Frequency inverters are used for driving moving parts and they may become hot at the surface during operation.
Any unauthorized removal of the necessary covers, improper use, wrong installation or operation may result in serious injuries or material damage.
In order to avoid such injuries or damage, only qualified staff may carry out the transport, installation, setup or maintenance work required. The standards EN 50178, IEC 60364 (Cenelec HD 384 or DIN VDE 0100), IEC 60664-1 (Cenelec HD 625 or VDE 0110-1), BGV A2 (VBG 4) as well as the applicable national regulations must be complied with. The term „Qualified Staff“ refers to anybody who is familiar with the installation, assembly, commissioning and operation of the frequency inverter as well as the possible hazards and has the proper qualification for the job.

1.2 Purpose of the Frequency Inverters

Warning! The frequency inverters are electrical drive components intended for installation in industrial plants or machines. Commissioning and start of operation is not allowed until it has been verified that the machine meets the requirements of the EC Machinery Directive 98/37/EEC and EN 60204. In accordance with the CE marking requirements, the frequency inverters also comply with the Low Voltage Directive 72/23/EEC as well as EN 50178 / DIN VDE 0160 and EN 61800-2. The user shall be responsible for making sure that the requirements of the EMC Directive 89/336/EEC are met. Frequency inverters are only available at specialized dealers and are exclusively intended for professional use as per EN 61000-3-2.

The frequency inverters are also marked with the UL label according to UL508c, which proves that they also meet the requirements of the CSA Standard C22.2-No. 14-95.

The technical data, connection specifications and information on ambient conditions are indicated on the name plate and in the documentation and must be complied with in any case. Anyone involved in any kind of work at the device must have read the instructions carefully and understood them before starting the work.

Do not connect any capacitive loads.

1.3 Transport and Storage

The frequency inverters must be transported and stored in an appropriate way. During transport and storage the devices must remain in their original packaging. The units may only be stored in dry rooms which are protected against dust and moisture and are exposed to little temperature deviations only. Observe the climatic conditions according to EN 50178 and the marking on the packaging. The frequency inverters must not be stored for more than one year without connecting them to nominal voltage.

1.4 Handling and Installation

Warning! Damaged or destroyed components must not be put into operation because they may be a health hazard.

The frequency inverters are to be used in accordance with the documentation as well as the applicable directives and standards. They must be handled carefully and protected against mechanical stress. Do not bend any components or change the isolating distances. Do not touch electronic components or contacts. The devices are equipped with components which are sensitive to electrostatic energy and can easily be damaged if handled improperly. Any use of damaged or destroyed components shall be considered as a non-compliance with the applicable standards. Do not remove any warning signs from the device.

1.5 Electrical Connection

Warning! Before any assembly or connection work, discharge the frequency inverter. Verify that the frequency inverter is discharged.
Do not touch the terminals because the capacitors may still be charged.
Comply with the information given in the operating instructions and on the frequency inverter label.

When working at the frequency inverters, comply with the applicable standards BGV A2 (VBG 4), VDE 0100 and other national directives. Comply with the electrical installation instructions given in the documentation as well as the relevant directives. The manufacturer of the industrial machine or plant is responsible for making sure that the limit values specified in the EMC product standard EN 61800-3 for electrical variable-speed drives are complied with. The documentation contains information on EMC-conforming installation. The cables connected to the frequency inverters may not be subjected to high-voltage insulation tests unless appropriate circuitry measures are taken before.

1.6 Information on Use

Warning! The frequency inverter may be connected to power supply every 60 s. This must be considered when operating a mains contactor in jog operation mode. For commissioning or after an emergency stop, a non-recurrent, direct restart is permissible.
After a failure and restoration of the power supply, the motor may start unexpectedly if the AutoStart function is activated.
If staff is endangered, a restart of the motor must be prevented by means of external circuitry.
Before commissioning and the start of the operation, make sure to fix all covers and check the terminals. Check the additional monitoring and protective devices according to EN 60204 and applicable the safety directives (e.g. Working Machines Act, Accident Prevention Directives etc.).
No connection work may be performed, while the system is in operation.

1.7 Maintenance and Service

Warning! Unauthorized opening and improper interventions can lead to personal injury or material damage. Repairs on the frequency inverters may only be carried out by the manufacturer or persons authorized by the manufacturer. Check protective equipment regularly.

2 Description of System

With the Function Table (FT), external digital signals and internal logic signals of the frequency inverter can be linked to one another. Function table functions are also referred to as FT-instructions.
The results of the FT-instructions can be used by other device functions (e.g. comparator) or output via digital outputs. The results can also be used as input values by other FT instructions.
For parameterization of the function table using the VTable application, the commissioning and diagnosis software VPlus, version 4 or higher is required. The FT instructions can be parameterized as tables via VTable. Each FT-instruction is represented in VTable by a column.
Within the table, the functions are processed column by column (index by index) down to parameter setting "0 - Off (last table entry)" for *FT-instruction* **1343**. Then, the processing is started again with the first column of the table (the first index).

Function table:

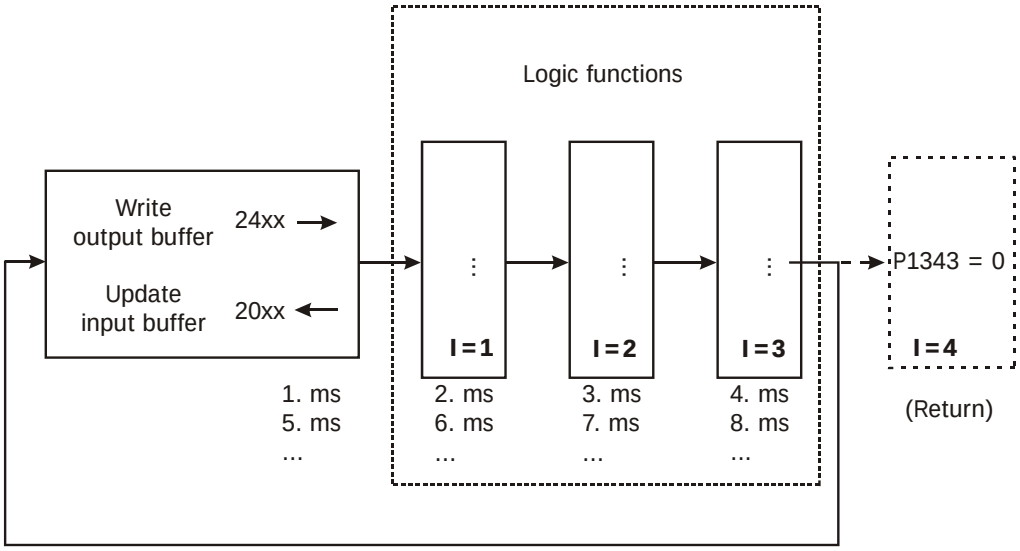
- Access to the FT instructions is via a table (VTable).
- Up to 32 FT-instructions are available via the index parameters of the table.
- Each column of the table describes an instruction.
- The processing order corresponds to the order in the table (index 1 to 32).
- Via an input buffer, signal sources (e.g. run signal, error signal) and digital inputs (e.g. S2IND) can be assigned to the FT-instruction inputs. The input buffer enables 16 entries and contains, by default, typical signal sources/digital inputs.
- Via an output buffer, the output values of the FT-instructions can be made generally (globally) available and used by other functions or output via digital outputs. Up to 16 signal sources can be used as an "output buffer" for this purpose.
- All output values of the FT instructions have defined values when the frequency inverter is initialized. They are logic “0" for all FT-instruction outputs and all output buffer values. After initialization, the inverted FT-instruction outputs are logic “1".
- The outputs of FT-instructions can be assigned to other device functions (e.g. Start Clockwise, Switch Data Set etc.) or digital outputs (e.g. S1OUT).
- Processing of the function table can be activated and deactivated by a parameter (Run / Stop).

Each column is described by a certain number of parameters:

- FT-instruction: Selection of FT-instruction (AND, OR, etc.).
- FT-inputs: FT-instructions have four inputs.
- FT-parameter 1 and FT-parameter 2: These parameters enable, depending on the selected FT-instruction, setting of delay times or jumps between functions.
- FT-target outputs: The value of a logic output can be moved to the output buffer and is then generally (globally) available to other device functions.

Each function also has two outputs A1 and A2 (A2 = A1 inverted). The output values of FT-instructions can also be used as input values in other FT-instructions.

2.1 Chronological processing of function table



The function table is processed cyclically. In the first step, the output buffer is written to the global variables 24xx, and the input buffer is updated in sources 20xx. Then the FT-instructions are processed, starting with Index 1.
A cycle is complete when a subsequent function is deactivated {*FT-instruction* **1343** = "0 - Off Last Table Item"} or the maximum number of FT-instructions was processed. Then the processing cycle is started again (write output buffer, update input buffer, index 1, index 2, ...).

The processing time of each instruction is 1 ms.
Additionally, 1 ms is required for writing the output signals 24xx and reading of input signals 20xx.
As a result, the cycle time is the total of instructions + 1 in milliseconds.

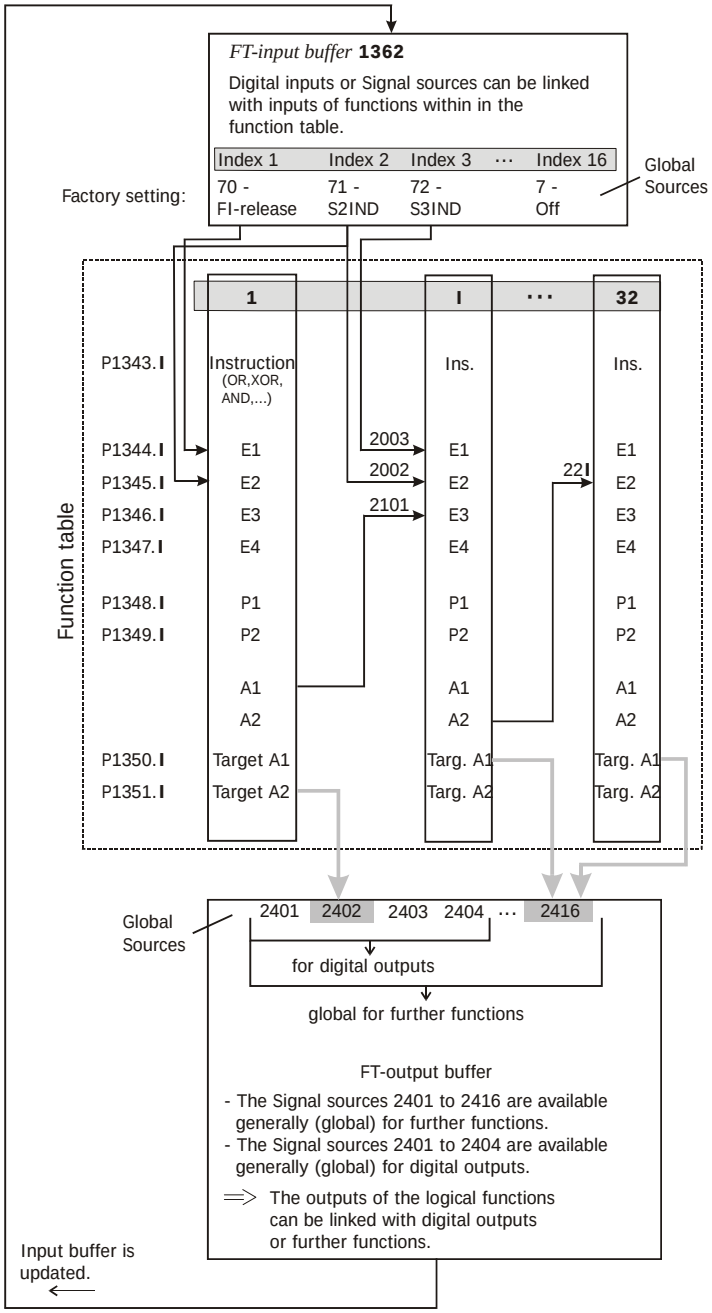
2.2 Starting the function table

By default (factory setting), the function table is stopped and must be started by parameter *FT-RunMode* **1399**. In stop mode, no instructions are processed and there is no writing of the output buffer.

Note: Instructions can only be edited in stop mode.

2.3 Principle

The function table processing principle is shown in the following diagram. The input buffer comprises 16 indices which can be assigned to global sources. By default, the digital input signals of the basic device and various other, frequently used signals are entered in the input buffer. The values in the input buffer are available to the instructions as sources (range 20xx).
The instructions are linked to 4 input values. Depending on the type of instructions, two parameters are used for adjusting special instruction functions. The outputs of the instructions can be used as inputs of other functions (non-negated outputs 21xx and negated outputs 22xx).
In addition, the outputs can be used as sources for global variables.
The instructions are processed one after the other, starting with instruction 1. When the processing cycle jumps back to start, the output buffer is written and the input buffer is updated.
Jump functions enable branching off to certain blocks. The instruction parameters of the jump function additionally enable selective writing of the output buffer and updating of the input buffer.



Abbreviations used:

FT:	Function table
I:	Index of function table (1 ... 32)
P.:	Parameter
E:	Input
A1, A2:	Outputs for links within the function table (internal)
Target A1, Target A2:	Outputs for global links. P1350 and P1351 are needed for global links only.

At first, the output buffer is updated. Then, the input buffer is updated. The values of the global sources are taken over in the output buffer. Then, the global input values in the input buffer are updated.

2.4 Input buffer/output buffer

In the frequency inverter, the digital signals can be used in various ways. The number of possible function table signals, however, is very high. As a result, it would be confusing if all signals were available globally.
For this reason, the number of globally available signals is limited via an input buffer and an output buffer. In addition, the input buffer is updated and the output buffer is written at a defined point of time. In this way it is ensured that the processing within a cycle is performed based on the same input data and inconsistent statuses are avoided.

Input buffer:
By default, the input buffer is filled with various digital signals. BONFIGLIOLI VECTRON recommends keeping the standard settings if possible. This makes diagnosis and commissioning easier.

Output buffer:
By default, the output buffer is linked without any signals. In order to write a digital output, a FT-target output must be assigned first (e.g. operation mode "2402 - FT-Output Buffer 2"). Then, the signal must be assigned to the device function. Operation modes 2401 to 2404 are available to digital outputs. Operation modes 2401 to 2416 are available to other functions, e.g. comparators.

At the start of a cycle, the input buffer is read and kept in the function table memory until the next return jump. Then, the instructions are processed. The output buffer is written at the end of the cycle and is available in the global sources after that.
By selective use of the jump function, the input buffer and output buffer can be set and written either separately or jointly. This enables setting of the digital output signals during a cycle.

FT-input buffer 1362			
Index	Factory setting	Index	Factory setting
1	70 - Inverter Release	9	7 - Off
2	71 - S2IND -	10	7 - Off
3	72 - S3IND	11	160 - Standby Message
4	73 - S4IND	12	161 - Run Message
5	74 - S5IND	13	162 - Error Signal
6	75 - S6IND	14	163 - Reference Frequency Reached
7	76 - MFI1D	15	7 - Off
8	7 - Off	16	7 - Off

Note: The input and output buffers are set and written during **the return jump**. This is done in one processing cycle. The output buffer is written **first, after that** the input buffer is set.

3 Commissioning

The function table is deposited internally via index-based parameters. In this way, the parameter number is the same for each instruction and the presentation is very straightforward. Via the index, the individual instructions are addressed and thus identified clearly. BONFIGLIOLI VECTRON recommends using the program VTable of the commissioning and diagnosis software VPlus for commissioning and editing the instructions. VTable enables comfortable and straightforward parameterization of the whole function table.

Note: In the KP500 control unit, parameter numbers > 999 are represented in hexadecimal form (999, A00 ... B54 ... C66 ...) concerning the leading numeral.

3.1 Write index and read index

3.1.1 Write index and read index for FT-instructions

Via the write and read indices, the index of the instruction the parameters of which are to be read or written is specified. VTable uses the parameters automatically for writing and reading. The write and read parameters are required for parameterization via keypad or for parameterization via a bus system (e.g. PROFIBUS).

Write index and read index for parameterization and reading of FT-instructions via software VPlus

The FT-instructions can be parameterized in the user interface VPlus or in the function table VTable. In the user interface VPlus, an index of the function table can be created via parameter *FT-write index (FT-table item)* **1341**. The chosen index corresponds to a column in the function table. The settings of parameters **1343** to **1351** are taken over in the selected index of the function table. Via parameter *FT-read index (FT-table item)* **1342**, the values of a selected index can be read from the function table.

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Fact. sett.**
1341	FT-write index (FT-table item)	0	65	1
1342	FT-read index (FT-table item)	0	65	1

Settings for fixed parameterization (non-volatile):
0: all instructions in EEPROM
1 ... 32: individual instructions in EEPROM

Settings only required for parameterization via communication interface (volatile):
33: all instructions in RAM
34 ... 65: individual instructions in RAM

Note: The settings "0" and "33" for *FT-write index (FT-table item)* **1341** change all functions in EEPROM and RAM.

In the case of non-volatile storage (0...32), the changed values are still available when power supply is switched on again.

In the case of volatile storage (33...65), the data is only stored in RAM. If the unit is switched off, this data is lost and the data required are loaded from EEPROM.

Definition:
Instruction RAM = instruction EEPROM +33

VPlus

Parameter	D-Satz 0
FT-Write index (FT-table item) **1341**	2
FT-Read index (FT-table item) **1342**	2
FT-instruction **1343**	AND
FT-input 1 **1344**	...
FT-input 2 **1345**	...
FT-input 3 **1346**	...
FT-input 4 **1347**	
FT-Parameter 1 **1348**	
FT-Parameter 2 **1349**	
FT-target output 1 **1350**	
FT-target output 2 **1351**	
FT-actual values output buffer **1357**	
FT-actual values input buffer **1358**	

VTable

Funktionentabelle	Index 1	Index 2
FT-instruction **1343**	2 - OR	1 - AND
FT-input 1 **1344**	...	...
FT-input 2 **1345**	...	...
FT-input 3 **1346**	...	...
FT-input 4 **1347**	...	...
FT-Parameter 1 **1348**	...	...
FT-Parameter 2 **1349**	...	...
FT-target output 1 **1350**	...	...
FT-target output 2 **1351**	...	...

For parameterization using the function table VTable, the commissioning and diagnosis software VPlus, version 4 or higher is required.

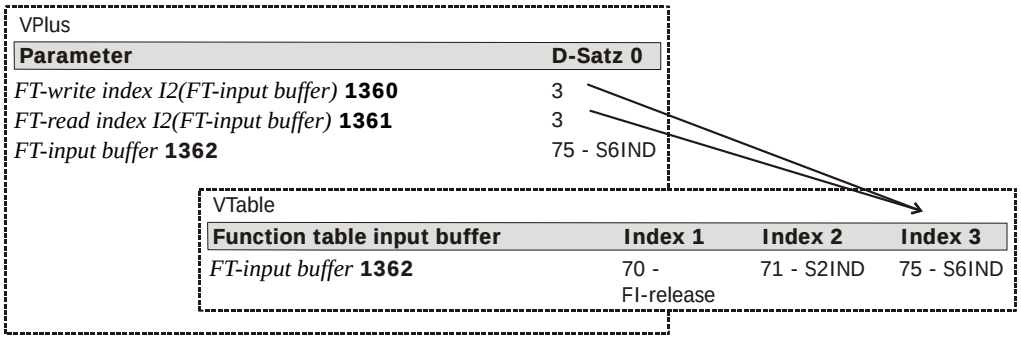
3.1.2 Write index and read index for input buffer

Via the write and read indices, the index of the input buffer to be read or written is specified.

Write index and read index for parameterization and reading of input buffer via software VPlus

The input buffer can be parameterized in the user interface VPlus or in the function table VTable. In the user interface VPlus, an index of the function table can be created via parameter *FT-write index I2(FT-input buffer)* **1360**. The selected index corresponds to a table column in "Function Table Input Buffer" and thus to an index of parameter *FT-input buffer* **1362**. The setting (selection of signal source or digital input) of parameter *FT-input buffer* **1362** is taken over in the selected index of "Function Table Input Buffer". Via parameter *FT-read index I2(FT-input buffer)* **1361**, the values of a selected index can be read from "Function Table Input Buffer".

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Fact. sett.**
1360	FT-write index I2(FT-input buffer)	0	33	1
1361	FT-read index I2(FT-input buffer)	0	33	1



Settings for fixed parameterization (non-volatile):
0: all input buffers in EEPROM
1 ... 16: single input buffer in EEPROM

Settings only required for parameterization via communication interface (volatile):
17: all input buffers in RAM
18 ... 33: single input buffer in RAM

Note: The settings"0" and "16" for *FT-input buffer* **1362** change all functions in EEPROM and RAM.

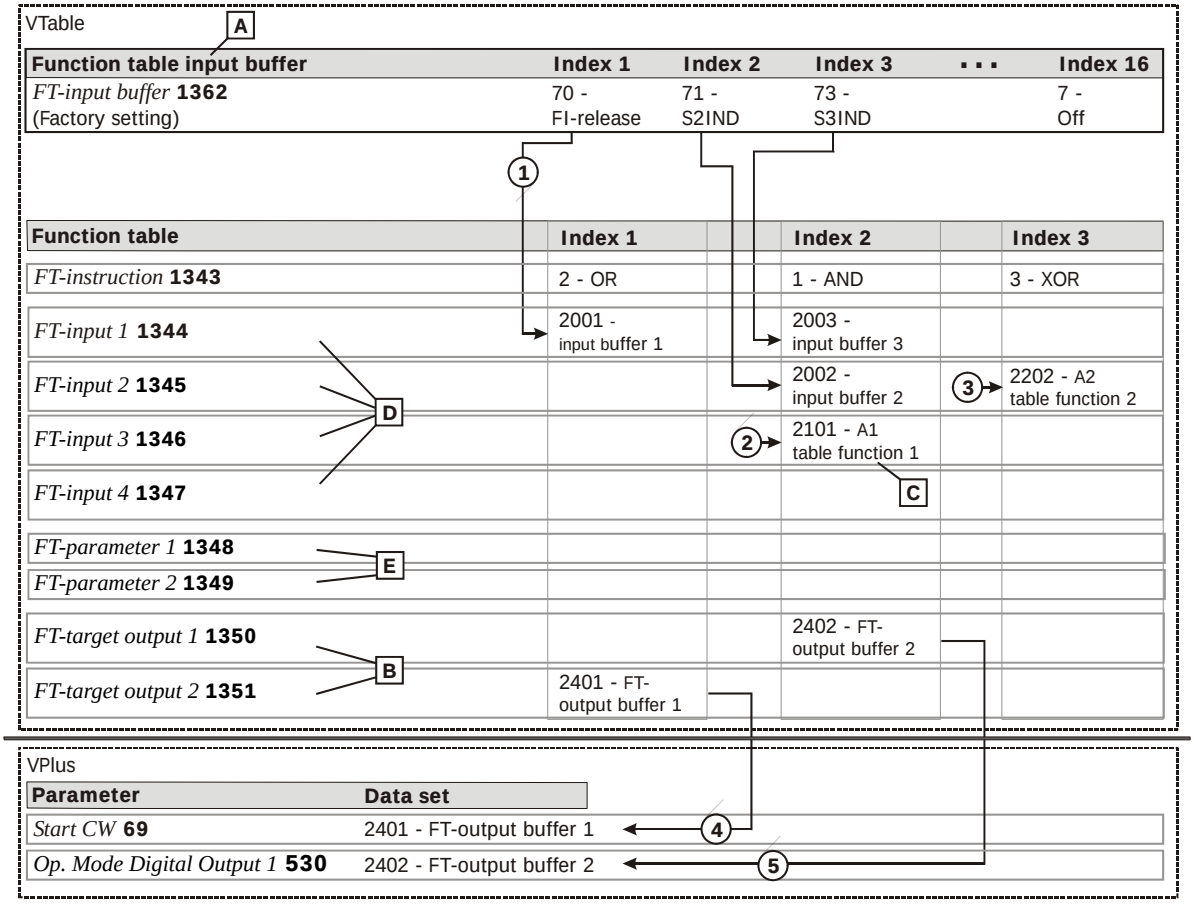
In the case of non-volatile storage (0...32), the changed values are still available when power supply is switched on again.

In the case of volatile storage (33...65), the data is only stored in RAM. If the unit is switched off, this data is lost and the data required are loaded from EEPROM.

Definition:
Input buffer RAM = input buffer EEPROM +17

3.2 Parameterization in function table VTable

Click on  button in VPlus to open the function table VTable.



① Link the input of a FT-instruction to a digital input or signal source. See Chapter 3.8.3.

② Link the input of a FT-instruction to the output of a FT-instruction. See Chapter 3.8.4

③ Link the input of a FT-instruction to the inverted output of a FT-instruction. See Chapter 3.8.4

④ Link the output of a FT-instruction to a function outside of the function table. Link to signal sources "FT- Buffer" required. See Chapter 3.8.6.

⑤ Output the output value of a FT-instruction via a digital output. Link to signal sources "FT- Buffer" required. See Chapter 3.8.7.

FT: Function table

A **Function table input buffer**: Digital inputs and signal sources (which are no output signals of FT-instructions) are made available to the inputs of FT-instructions. In Index 1 to 16, the different digital inputs and signal sources required for the inputs of the FT-instructions can be selected.

Example: Link of FT-input 1 of FT-instruction 2 (Index 2) to digital input S3IND:
- In Index 3 of function table input buffer:
  Parameters *FT-input buffer* **1362** = "73 - S3IND",
- In Index 2 of function table:
  FT-input 1 **1344** = "2003 - Input Buffer 3".

A digital input or signal source can be linked to several FT-instruction inputs.

B Parameters for selection of signal source "**FT-Output Buffer**": Signal sources 2401 to 2416 can be used for making the output value of a FT-instructions generally (globally) available. This is required if
- the output of a FT-instruction is to be linked to another device function (no FT-instruction), e.g. to "Start Anticlockwise"
- the output value of a FT-instruction is to be output via the digital output of the frequency inverter (only possible with 2401 to 2404).

In parameter *FT-target output 1* **1350** or *FT-target output 2* **1351**, a target must be selected for the output value of the FT-instruction.
The output value of the FT-instruction is saved in this target, the selected signal source "FT-Output Buffer".

Example: Link of output 2 of FT-instruction 1 (Index 1) to function "Start Anticlockwise":
- In Index 1 of function table:
  FT-target output 2 **1351** = "2401 - FT-Output Buffer 1".
- In VPlus:
  Start Anticlockwise **69** = "2401 - FT-Output Buffer".

C Signal source "**Table Function Output**": Signal sources 2101 to 2232 can be used if the output value of a FT instruction is to be present at the input of another FT-instruction. Signal sources 2201 to 2232 (A2) are the inverted values of signal sources 2101 to 2132 (A1).

Example: Link of FT-Output 1 of FT-instruction 1 to FT-Input 3 of FT-instruction 2:
- In Index 2 of function table:
  FT-input 3 **1346** = "2101 - A1 Table Function 1".

D The four **Inputs** E1, E2, E3 and E4 of a FT-instruction for links to
- signal sources or digital inputs of input buffer or
- outputs of FT-instructions.

E The two parameters enable, depending on the FT-instruction, setting of **delay times** or **jumps** between functions, for example.

The above schematic representation describes the general procedure for parameterization of the function table and is no actual application example.

3.3 Run / Stop

By default (factory setting) the function table is stopped and must be started by parameter *FT-RunMode* **1399**. In stop mode, no instructions are processed and there is no writing of the output buffer.

Note: Instructions can only be edited in stop mode. If you try to make any changes while the function table is not in stop mode, an error will be displayed in VPlus. The change will not be taken over.

Further operation modes are available for processing individual instructions and instruction blocks. If an operation mode 11, 12, 21, 22, 31 or 32 is selected, the instruction block[1)] will be processed according to the function described. Then, Run mode will be set to "0-Stop" automatically. In order to process another application block, the operation mode must be set to the corresponding value again.

FT-RunMode **1399**	Function
0 - Stop	The function table is stopped and no longer processed.
1 - Run	The function table is started at index 1 and processed normally.
2 - Continue	The function table is continued at the index where the processing was stopped last time, and the table is then processed normally.
11 - 12 - Single Step	One instruction is processed.
21 - 22 - Single Part	All instructions are processed until next writing of output buffer.
31 - 32 - Single Cycle	All instructions are processed until return jump. The return jump is reached when the maximum number of logic functions is processed or the next *FT-instruction* **1343** = 0.

[1)] In this connection, an instruction block may also include a single instruction.

Note: Two modes are available to an instruction block (1x, 2x, 3x).
For control of a **PLC** it is sufficient to select a mode and set it accordingly. When the instruction block was processed, the frequency inverter resets the operation mode to "0-Stop" automatically. The same mode can be selected again.

Note: If a diagnosis via **VPlus** is to be performed, both modes are required. Execution of the instruction block must be started by the modes alternately, because VPlus only updates parameters (on ACU) which have been changed.

Note: If "Single Step", "Single Part" or "Single Cycle" are selected, the selected mode is maintained. The status of the function table is shown exactly in *FT-actual values function* **1356**.

3.3.1 Example Run/Stop

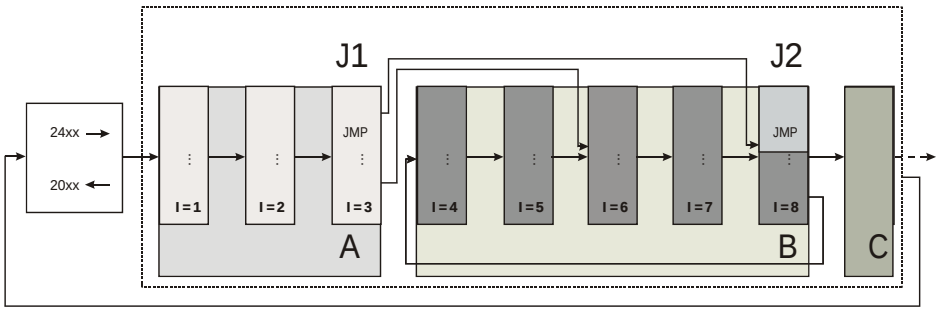
The following diagram shows a function block circuit which includes two jump functions (J1 and J2). Depending on the settings of parameter *FT-RunMode* **1399**, the procedure is as follows:

FT-RunMode **1399** = "1 – Run"
The sequence is processed continuously. Jump functions are processed according to input statuses.

FT-RunMode **1399** = "11 – Single Step", "12 – Single Step"
The sequence is interrupted after each instruction. Each time, the sequence is stopped, *FT-RunMode* **1399** must be restarted with "11 – Single Step" or "12 – Single Step". Jump functions are processed according to input statuses. Thus, the sequence is "I=1, Stop"; "I=2, Stop";...

FT-RunMode **1399** = "21 – Single Part", "12 – Single Part"
The sequence is processed until a jump instruction is reached which writes the output buffer. In this example, the buffer is written by both jump instructions. Thus, the sequence is "Block A, Stop"; "Block B, Stop";...

FT-RunMode **1399** = "31 – Single Cycle", "32 – Single Cycle"
The sequence is processed until the end is reached and the return jump to the start is affected (to block C). It may happen that Block B is processed repeatedly depending on the digital signals if the jump at J2 jumps to the beginning of Block B. A cycle may be, for example: "Block A, Block B, Block B, Block B, Block C, return jump, stop".



3.4 Comment field

In order to make the parameterization readily readable, one comment field is available per instruction. This can be used for entering a brief description for easier diagnosis. Comments of a length of up to 16 characters can be entered in parameter *FT-commentary* **1352**

Example:
FT-commentary **1352** = "Jump to Block 2"

3.5 Overview of functions

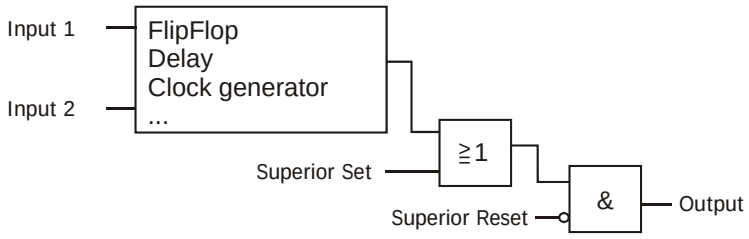
3.5.1 Superior / Master

Via parameter *FT-instruction* **1343**, the FT-instruction can be selected. For more details and examples, refer to Chapter 4.

Most instructions also enable setting of selective output statuses by overriding inputs. This may be used, for example, for initialization of a plant status.
There are 2 variants of instructions with overriding inputs.

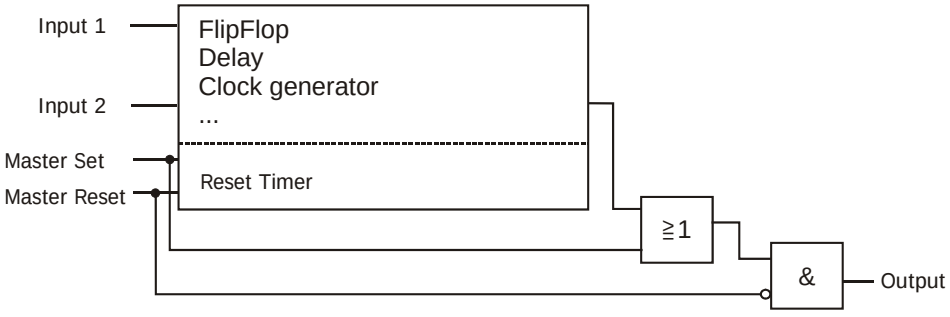
Superior

- The function sequence is processed further internally in the instruction. The overriding inputs change the instruction output only for the time in which the overriding signal is present.
- During the set/reset phase, edges will also be detected and processed internally. If the Superior Set/Superior Reset Signal is no longer present, the output will take the value which would result without the Set/Reset Phase.
- The processing sequence can be compared to a series connection of the function and a logic AND operation with the superior inputs.



Master

- The function sequence is interrupted. The overriding inputs change the instruction output as from the time at which the overriding signal is present.
- Set/Reset signals are not evaluated as long as a Master-Set/Master-Reset is present.
- The processing sequence can be compared to a parallel connection of the function and the master inputs.



Superior	**Master**	
Superior-Set	Master-Set	Logic "1" at Superior-Set/Master-Set switches instruction output 1 to "1" signal directly.
Superior-Reset	Master-Reset	Logic "1" at Superior-Reset/Master-Reset switches instruction output 1 to "0" signal directly. Reset has a higher priority than set.

3.5.2 Overview table

Note:

- Unused inputs must be set to "7 - Off" (default setting of all FT-inputs).
  Exception: Unused inputs of FT-instruction "**AND**" must be set to "6 - On".
- In all functions, output 2 has the inverted logic state of input 1.
- Clock inputs (T, C) evaluate signal edges.
- Set/Superior-Set/Master-Set inputs and Reset/Superior-Reset/Master-Reset inputs evaluate logic states.
- Reset has priority over Set.
- Times set for *FT-parameter 1* **1348** and *FT-parameter 2* **1349**, are limited internally to a max. value of 24 days.

FT-instruction **1343**	Function
0 - Off (last table item)	Return jump to FT-instruction 1 (in Index 1). Last function processed in function table.
1 - AND	Up to 4 inputs are AND-linked to one another. Output is logic "1" if all inputs are logic "1".
2 - OR	Up to 4 inputs are OR-linked to one another. Output is logic "1" if at least one input is logic "1".
3 - XOR 1	Up to 4 inputs are EXCLUSIVE OR-linked to one another. Output is logic "1" only if logic "1" is present on exactly one input.
4 - XOR 1||3	Up to 4 inputs are EXCLUSIVE OR-linked to one another. The output is logic "1" only if logic "1" is present on an odd number of inputs. The output is logic "0" only if logic "1" is present on an even number of inputs.
10 - RS-Flip-Flop	Input 1: Set; logic "1" sets output to "1". Input 2: Reset; logic "1" sets output to "0". Input 3: Superior-Set; logic "1" sets output to "1". Input 4: Superior-Reset; logic "1" sets output to "0". Logic "0" at Set and Reset: Last output signal state is maintained.
20 - Toggle-Flip-Flop	Output signal changes with the positive pulse edge at input 1 or with the negative pulse edge at input 2. Logic "1" at Superior-Set input (input 3) sets output "1". Logic "1" at Superior-Reset input (input 4) sets output "0".
30 - D-Flip-Flop	If a positive edge is received at input 1 (clock pulse input C, Clock) the signal present at input 2 (data input D) is transferred to the output. Logic "1" at Superior-Set input (input 3) sets output "1". Logic "1" at Superior-Reset input (input 4) sets output "0".

FT-instruction **1343**		Function
40 -	Delay ms (re-triggerable)	The positive edge at input 1 is delayed by the time set in *FT-parameter 1* **1348** and the negative edge is delayed by the time set in *FT-parameter 2* **1349** before switching them through to the output. The delay time starts again with each edge. Times are indicated in milliseconds [ms]. Logic "1" at Superior-Set input (input 3) sets output "1". Logic "1" at Superior-Reset input (input 4) sets output "0".
41 -	Delay s (retrig-gerable)	Like operation mode 40, but times set in *FT-parameter 1* **1348** and *FT-parameter 2* **1349** are indicated in seconds [s].
42 -	Delay min (re-triggerable)	Like operation mode 40, but times set in *FT-parameter 1* **1348** and *FT-parameter 2* **1349** are indicated in minutes [min].
50 -	Delay ms (not retriggerable)	The positive edge at input 1 {Parameter *FT-input 1* **1344**} is delayed by the time set in *FT-parameter 1* **1348** and the negative edge is delayed by the time set in *FT-parameter 2* **1349** before switching them through to the output. During the delay time, edges will be ignored. Times are indicated in milliseconds [ms]. Logic "1" at Superior-Set input (input 3) sets output "1". Logic "1" at Superior-Reset input (input 4) sets output "0".
51 -	Delay s (not retriggerable)	Like operation mode 50, but times set in *FT-parameter 1* **1348** and *FT-parameter 2* **1349** are indicated in seconds [s].
52 -	Delay min (not retriggerable)	Like operation mode 50, but times set in *FT-parameter 1* **1348** and *FT-parameter 2* **1349** are indicated in minutes [min].
60 -	Monoflop ms (retriggerable)	Output signal becomes logic "1" with positive clock edge at input 1 or with negative clock edge at input 2. The time set in *FT-parameter 1* **1348** is the On-Time (High) and the time set in *FT-parameter 2* **1349** is the ignore edge time (Low). The time is indicated in milliseconds [ms]. The set on-time and the ignore edge time start again with each edge. Logic "1" at Superior-Set input (input 3) sets output "1". Logic "1" at Superior-Reset input (input 4) sets output "0".
61 -	Monoflop s (re-triggerable)	Like operation mode 60, but times set in *FT-parameter 1* **1348** and *FT-parameter 2* **1349** are indicated in seconds [s].
62 -	Monoflop min (retriggerable)	Like operation mode 60, but times set in *FT-parameter 1* **1348** and *FT-parameter 2* **1349** are indicated in minutes [min].

FT-instruction **1343**		Function
70 -	Monoflop ms (not retrigger-able)	Output signal becomes logic "1" with positive clock edge at input 1 or with negative clock edge at input 2. The time set in *FT-parameter 1* **1348** is the On-Time (High) and the time set in *FT-parameter 2* **1349** is the ignore edge time (Low). The time is indicated in milliseconds [ms]. Edges during the selected ON time and the ignore edge time will be ignored. Logic "1" at Superior-Set input (input 3) sets output "1". Logic "1" at Superior-Reset input (input 4) sets output "0".
71 -	Monoflop s (not retriggerable)	Like operation mode 70, but times set in *FT-parameter 1* **1348** and *FT-parameter 2* **1349** are indicated in seconds [s].
72 -	Monoflop min (not retrigger-able)	Like operation mode 70, but times set in *FT-parameter 1* **1348** and *FT-parameter 2* **1349** are indicated in minutes [min].
80 -	Clock Generator ms	As long as input 1 is logic "1" and input 2 is logic "0", the set pulse pattern is output. The clock pattern is defined by the on-time and the off-time. The time set in *FT-parameter 1* **1348** is the on-time (High) and the time set in *FT-parameter 2* **1349** is the off-time (Low). The time is indicated in milliseconds [ms]. Logic "1" at Superior-Set input (input 3) sets output "1". Logic "1" at Superior-Reset input (input 4) sets output "0".
81 -	Clock Generator s	Like operation mode 80, but times set in *FT-parameter 1* **1348** and *FT-parameter 2* **1349** are indicated in seconds [s].
82 -	Clock Generator min	Like operation mode 80, but times set in *FT-parameter 1* **1348** and *FT-parameter 2* **1349** are indicated in minutes [min].
90 -	Digital Multi-plexor (Data Set Number)	Depending on the current data set, the input values are passed on to the output values Data set = 1: Output 1 = Input 1, Data set = 2: Output 1 = Input 2, Data set = 3: Output 1 = Input 3, Data set = 4: Output 1 = Input 4
91 -	Switch Data Set	Switching-over of data set depending on input signals.
100 -	Jump function	Branching off to table column (index).
110 ... 182		Like instruction types 10 ... 82. Evaluation of Master-Set/Master-Reset instead of Superior-Set/Superior-Reset.

3.6 Inputs

Functions of parameters for the inputs of the FT-instructions depending on settings of parameter *FT-instruction* **1343**:

FT-instruction **1343**	*FT-input 1* **1344**	*FT-input 2* **1345**	*FT-Input 3* **1346**	*FT-input 4* **1347**
0 - Off (last table item)	-	-	-	-
1 - AND	Input 1	Input 2	Input 3	Input 4
2 - OR	Input 1	Input 2	Input 3	Input 4
3 - XOR 1	Input 1	Input 2	Input 3	Input 4
4 - XOR 1||3	Input 1	Input 2	Input 3	Input 4
10 - RS-Flip-Flop	Set	Reset	Superior-Set	Superior-Reset
20 - Toggle-Flip-Flop	Input +	Input -	Superior-Set	Superior-Reset
30 - D-Flip-Flop	Clock input C	Data input D	Superior-Set	Superior-Reset
4x - Delay (retriggerable)	Input	-	Superior-Set	Superior-Reset
5x - Delay (not retriggerable)	Input	-	Superior-Set	Superior-Reset
6x - Monoflop (retriggerable)	Input +	Input -	Superior-Set	Superior-Reset
7x - Monoflop (not retriggerable)	Input +	Input -	Superior-Set	Superior-Reset
8x - Clock Generator	Input +	Input -	Superior-Set	Superior-Reset
90 - Digital Multiplexor (data set number)	Input 1	Input 2	Input 3	Input 4
91 - Switch Data Set	Input 1	Input 2	Input 3	Input 4
100 - Jump Function	Activate jump target	Jump target	Update input buffer	Update output buffer
110 - RS-Flip-Flop	Set	Reset	Master-Set	Master-Reset
120 - Toggle-Flip-Flop	Input +	Input -	Master-Set	Master-Reset
130 - D-Flip-Flop	Clock input C	Data input D	Master-Set	Master-Reset
14x - Delay (retriggerable)	Input	-	Master-Set	Master-Reset
15x - Delay (not retriggerable)	Input	-	Master-Set	Master-Reset
16x - Monoflop (retriggerable)	Input +	Input -	Master-Set	Master-Reset
17x - Monoflop (not retriggerable)	Input +	Input -	Master-Set	Master-Reset
18x - Clock Generator	Input +	Input -	Master-Set	Master-Reset

Note: In instruction types 40 to 82 as well as 140 to 182 the "x" is used as a placeholder in the table. The instruction types can be parameterized in 3 different time bases:
0: milliseconds [ms],
1: seconds [s],
2: minutes [min].

3.7 Parameters for chronological behavior and jump target

The chronological behavior of the FT-instructions or a jump target can be adjusted via *FT-parameter 1* **1348** and *FT-parameter 2* **1349**.

3.7.1 Chronological behavior

The parameter settings affect the following functions:

Selection for *FT-instruction* **1343**:

40 ... 42 / 140 ... 142 50 ... 52 / 150 ... 152	Delay
60 ... 62 / 160 ... 162 70 ... 72 / 170 ... 172	Monoflop
80 ... 82 / 180 ... 182	Clock generator

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Fact. sett.**
1348	FT-parameter 1	0	Limited internally to 24 days	10
1349	FT-parameter 2	0		10

The units of *FT-parameter 1* **1348** and *FT-parameter 2* **1349** may be set to milliseconds [ms], seconds [s] or minutes [min]. The unit of the entered value depends on the setting of parameter *FT-instruction* **1343**. If, for example, 50 is entered for *FT-parameter 1* **1348** and *FT-instruction* **1343** is set to "60 - Monoflop ms (retriggerable)", the on-time of the monoflop is 50 **ms**. If, however, *FT-instruction* **1343** is set to "61 - Monoflop s (retriggerable)", the on-time of the monoflop is 50 **s**.

Note: Times set for *FT-parameter 1* **1348** and *FT-parameter 2* **1349**
- are limited internally to the maximum value of 24 days
- are not continued when the frequency is switched off and on again. The sequence is restarted from the beginning after re-activation.

3.7.2 Jump target

The evaluation of parameters affect the following functions:

Selection for *FT-instruction* **1343**:

100	Jump function

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Fact. sett.**
1348	FT-parameter 1	1	32	10
1349	FT-parameter 2	1	32	10

Note: The table shows typical and reasonable setting options. Value 0 and values greater than 32 can be entered.
If value 0 or values greater than 32 are selected, a return jump is affected, and the processing of the functions is continued by updating the output and input buffer.

3.7.3 Overview table

The meaning of the settings of *FT-parameter 1* **1348** and *FT-parameter 2* **1349** depending on the settings of parameter *FT-instruction* **1343** is shown in the following table.

FT-instruction 1343		*FT-parameter 1* 1348	*FT-parameter 2* 1349
40 - 140 -	Delay ms (retriggerable)	delay pos. edge [ms]	delay neg. edge [ms]
41 - 141 -	Delay s (retriggerable)	delay pos. edge [s]	delay neg. edge [s]
42 - 142 -	Delay min (retriggerable)	delay pos. edge [min]	delay neg. edge [min]
50 - 150 -	Delay ms (not retriggerable)	delay pos. edge [ms]	delay neg. edge [ms]
51 - 151 -	Delay s (not retriggerable)	delay pos. edge [s]	delay neg. edge [s]
52 - 152 -	Delay min (not retriggerable)	delay pos. edge [min]	delay neg. edge [min]
60 - 160 -	Monoflop ms (retriggerable)	ON time [ms]	ignore edge time [ms]
61 - 161 -	Monoflop s (retriggerable)	ON time [s]	ignore edge time [s]
62 - 162 -	Monoflop min (retriggerable)	ON time [min]	ignore edge time [min]
70 - 170 -	Monoflop ms (not retriggerable)	ON time [ms]	ignore edge time [ms]
71 - 171 -	Monoflop s (not retriggerable)	ON time [s]	ignore edge time [s]
72 - 172 -	Monoflop min (not retriggerable)	ON time [min]	ignore edge time [min]
80 - 180 -	Clock Generator ms	ON time [ms]	OFF time [ms]
81 - 181 -	Clock Generator s	ON time [s]	OFF time [s]
82 - 182 -	Clock Generator min	ON time [min]	OFF time [min]
100 -	Jump function	Jump target 1	Jump target 2

Note: Operation modes < 40 to 82 use Superior inputs,
operation modes < 140 to 182 use Master inputs as overriding inputs.

Note: In all other settings of parameter *FT-instruction* **1343** not listed in the above table, setting of *FT-parameter 1* **1348** and *FT-parameter 2* **1349** have no effect on the FT-instruction. In setting "1 - AND", for example, the input of values for *FT-parameter 1* **1348** and *FT-parameter 2* **1349** will not be considered. For better readability, BONFIGLIOLI VECTRON recommends to set the parameter values to "0" in these instructions.

3.8 Linking of inputs/outputs of FT-instructions

Inputs

Each FT-instruction has 4 inputs. The inputs can be linked to outputs of other FT-instructions (within the function table) or, outside of the function table, to digital inputs or global signal sources.

Outputs

Each FT-instruction has 2 outputs. In all functions, output 2 has the negated logic state of input 1. The two outputs can:
- be linked to inputs of other FT-instructions (within function table);
- linked to other functions outside of the function table;
- output via digital outputs.

Note: Changing the instructions (Parameters **1343**...**1351**) is only possible in stop mode (*FT-RunMmode* **1399** = "0-Stop"). If you try to make any changes while the function table is not in stop mode, an error will be displayed in VPlus. The change will not be taken over.

3.8.1 FT-inputs

The FT-inputs can either be linked to the FT-input buffer, the outputs of other instructions (normal or inverted) or the global output variables (FT-output buffer).

Note: Note that the FT-output buffer is updated only with a write operation (e.g. during return jump). The value used originates from the last write operation of the FT-output buffer.

Parameter	Possible signal sources	
FT-input 1 **1344** *FT-input 2* **1345** *FT-Input 3* **1346** *FT-input 4* **1347**	2001 ... 2016	(FT-input buffer)
	2101 ... 2232	(A1/A2 Table function)
	2401 ... 2416	(FT-output buffer)

3.8.2 FT-target outputs

Via parameters *FT-target output 1* **1350** and *FT-target output 2* **1351**, FT-Outputs A1 and A2 (A2 = inverted A1) can also be used outside of the function table.

Parameter	Possible signal sources
FT-target output 1 **1350** *FT-target output 2* **1351**	2401 ... 2416 (FT-output buffer)
Digital Outputs	80 ... 83 (FT-output buffer)

Note: Note that the FT-output buffer is updated only with a write operation (e.g. during return jump).

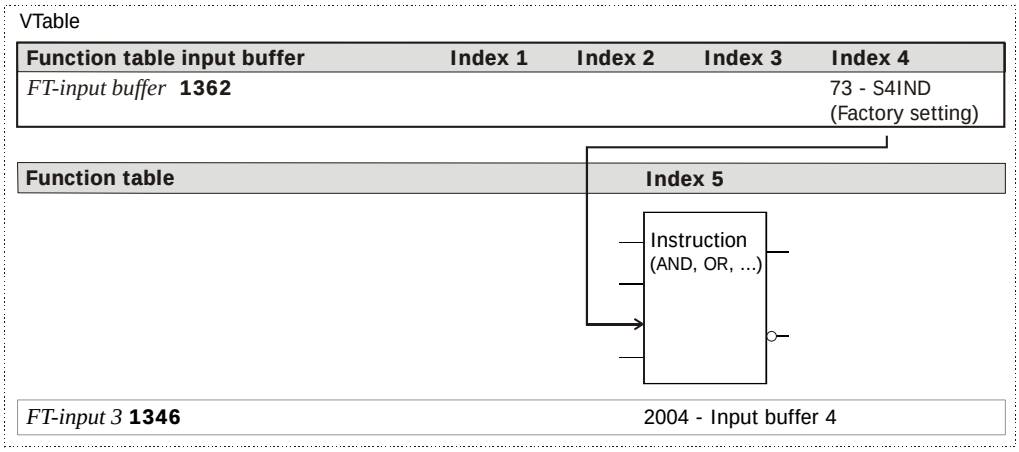
3.8.3 Linking FT-input buffer and FT-inputs

If the signal of a digital input (e.g. S4IND) or a signal source (e.g. 162 - Error Signal) is to be present at the input of a FT-instruction, an index of parameter *FT-input buffer* **1362** to this digital input or signal source must be set. As a result, the digital input or signal source is available for the inputs of the FT-instructions. Indices 1 to 16 of parameter *FT-input buffer* **1362** are set, by default, to the digital inputs of the frequency inverter and frequently used signal sources. Parameters *FT-input 1* **1344** to *FT-input 4* **1347** must be set to the required digital inputs or signal sources 2001...2016.

The digital input or signal source for a FT-instruction input is indicated in the following index of parameter *FT-input buffer* **1362**:		For a link to a FT-instruction input select for a parameter *FT-input 1* **1344** to *FT-input 4* **1347**:
Index	**Factory setting**	**Signal source**
Index 1	70 - Inverter Release (on S1IND)	2001 - Input Buffer 1
Index 2	71 - S2IND	2002 - Input Buffer 2
⋮	⋮	⋮
Index 16	7 - Off	2016 - Input Buffer 16

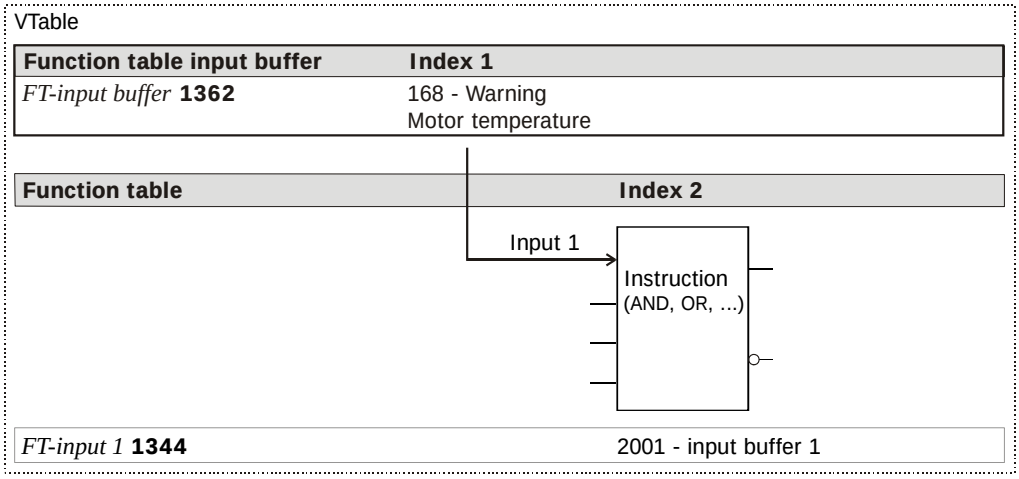
1. Example: Link of a FT-instruction input to a **digital input**: The signal on digital input S4IND is to be present at input 3 of instruction 5 (index 5 of table).

- Selection in index 4 of parameter *FT-input buffer* **1362**, for example:
  FT-input buffer **1362** = "73 - S3IND" (factory setting). As a result, the digital input is available for the inputs of the FT-instructions.
  Another index can also be used for selecting the digital input.
- Selection in index 5 of function table:
  FT-Input 3 **1346** = "2004 - Input Buffer 4".



2. Example: Link of a FT-instruction input to a **signal source**: The signal "Warning Motor Temperature" is to be present at input 1 of function 2 (index 2 of table).

- Selection in index 1 of parameter *FT-input buffer* **1362**, for example:
  FT-input buffer **1362** = "168 - Warning Motor Temperature". As a result, the signal source is available for the inputs of the FT-instructions.
  Another index can also be used for selecting the signal source.
- Selection in index 2 of function table:
  FT-input 1 **1344** = "2001 - Input Buffer 1".

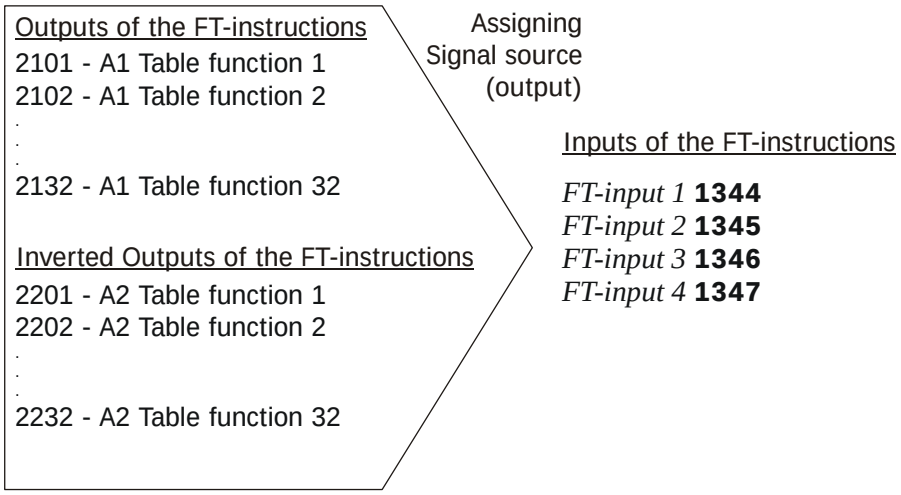


3.8.4 Linking instructions to one another (FT-Input)

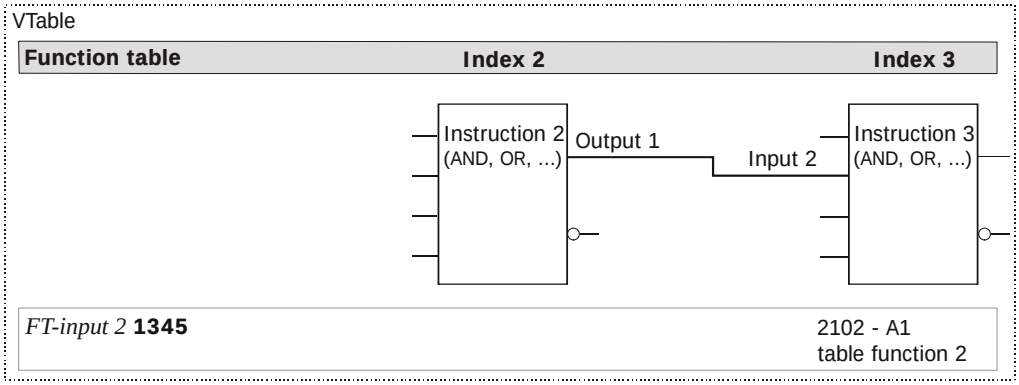
The outputs of the FT-instructions parameterized in the table are available as signal sources to inputs of FT-instructions. The outputs of the FT-instructions can be linked to inputs of FT-instructions via parameters *FT-input 1* **1344** to *FT-input 4* **1347**.

Outputs of FT-Instructions as signal sources for parameters *FT-input 1* 1344, *FT-input 2* 1345, *FT-Input 3* 1346, *FT-input 4* 1347	
Output 1 of FT-instruction xx 21xx -	**Output 2 (negated) of FT-instruction xx 22xx -**
2101 - A1 Table function 1	2201 - A2 Table function 1
2102 - A1 Table function 2	2202 - A2 Table function 2
2103 - A1 Table function 3	2203 - A2 Table function 3
2104 - A1 Table function 4	2204 - A2 Table function 4
. . .	. . .
2131 - A1 Table function 31	2231 - A2 Table function 31
2132 - A1 Table function 32	2232 - A2 Table function 32

Linking the input of a FT-function with an output of a FT-function



Example of link of FT-instruction input to an FT-instruction output: Output 1 of FT-instruction 2 (index 2 of function table) is required for linking to another logic function. The logic status of the output is to be present at input 2 of function 3 (Index 3 of logic table).



- In Index 3 of function table, set: *Parameter FT-input 2* **1345** = "2102 - A1 Table Function 2".

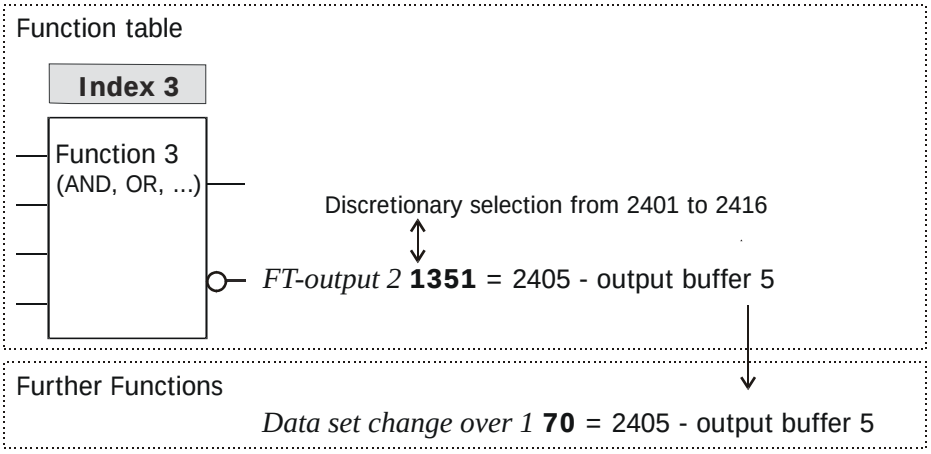
3.8.5 Linking output buffers (FT-target output)

Global sources for linking FT-instruction output to device functions outside of function table

The outputs of the FT-instructions parameterized in the logic table can be made available to device functions outside of the logic table as global signal sources. Outputs 1 and 2 of the FT-instructions can be defined as general (global) signal sources via parameters *FT-target output 1* **1350** and *FT-target output 2* **1351** for processing further device functions.

Outputs of FT-Instructions as signal sources for parameters *FT-target output 1* 1350 and *FT-target output 2* 1351	
2400 - Output not usable globally	
2401 - FT-Output Buffer 1	• Selection for *FT-target output 1* **1350**: Output 1 of the FT-instruction is available to other device functions outside of the function table as general signal source. • Selection for *FT-target output 2* **1351**: Output 2 (inverted to input 1) of the FT-instruction is available to other device functions outside of the function table as general signal source.
2402 - FT-Output Buffer 2	
2403 - FT-Output Buffer 3	
2404 - FT-Output Buffer 4	
2405 - FT-Output Buffer 5	
2406 - FT-Output Buffer 6	
.	
.	
.	
2415 - FT-Output Buffer 15	
2416 - FT-Output Buffer 16	

Example of links of FT-instruction outputs to device functions outside of function table: Output of instruction 3 (index 3 of function table) is required for linking to another device function. This function is no FT-instruction of the table and cannot be selected in the table {for parameter *FT-instruction* **1343**}. Output 2 of instruction 3 is to be defined as a general (global) signal source and activate the device function "Switch Data Set 1".



- Select a signal source for output 2 of FT-instruction 3, e.g. "2405 - FT-Output Buffer 5". This means, the following can be set in index 3 of the function table: Parameter *FT-target output 2* **1351** = "2405 - FT-Output Buffer 5". As a result, the signal source is generally (globally) available for processing by other device functions. It is also possible to choose another signal source from signal sources 2401 to 2416 for the parameter.
- For parameter *Switch Data Set 1* **70**, select signal source "2405 - FT-Output buffer 5".

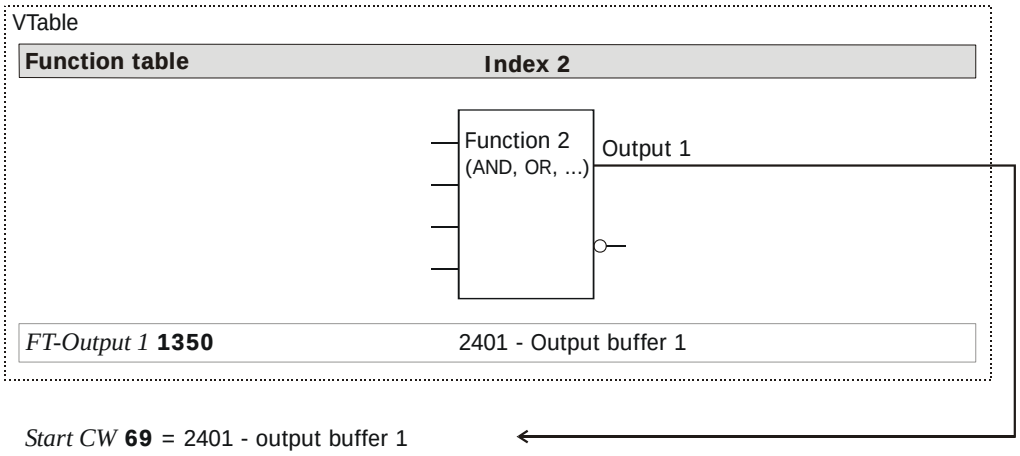
Note: The current output values of the FT-instructions are updated during a return jump or a write command of a jump instruction.

3.8.6 Activating device functions via the output buffer

If the logic state of the output is to activate a device function which cannot be selected in the function table, one of the signal sources "24xx FT-Output Buffer xx" must be selected for the output. As a result, the output is generally (globally) available to other device functions. The selected signal source must also be assigned to the device function to be activated. Up to 16 signal sources (index 1 to 16) can be used for further processing of logic states of FT-instruction outputs. A signal source can be assigned to several outputs of FT-instructions. For example, *FT-target output 1* **1350 =** "2401 - FT-Output Buffer 1" may be selected both in index 1 and in index 2.

Example: Linking a FT-instruction output to a device function outside of the function table:
Function "Start Anticlockwise" is to be activated via output 1 of function 2 (index 2 of the table).

- Selection in index 2 of table:
  FT-target output 1 **1350** = "2401 - FT-Output Buffer 1" (alternative selection also possible) As a result, the output is generally (globally) available to other device functions.
- Selection outside of function table:
  Start Anticlockwise **69** = "2401 - FT-Output Buffer 1" (according to selection for *FT-target output 1* **1350**).

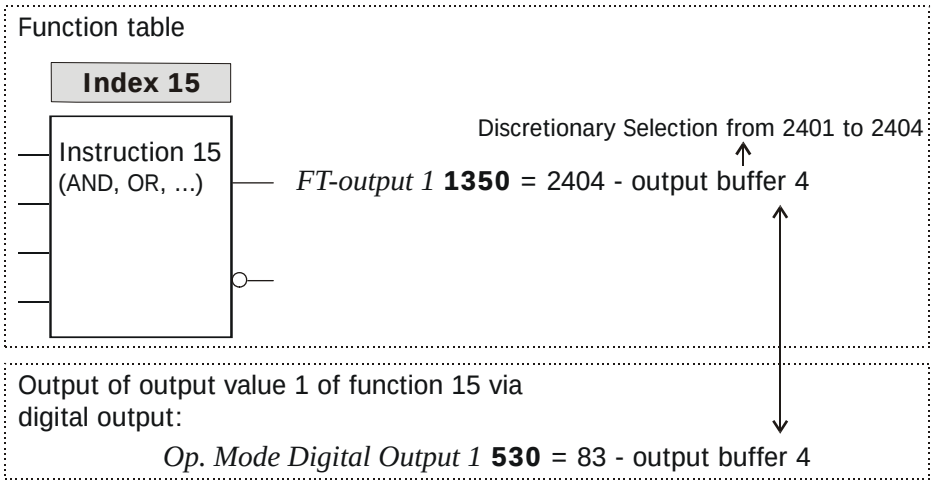


3.8.7 Controlling a digital output via the output buffer

The outputs of the FT-instructions can be output via digital outputs once they have been defined as general (global) signal sources.
For parameters *Op. Mode Digital Output 1* **530**, *Op. Mode Digital Output 3* **532** and *Digital Operation* **554** (MFO1), you can choose among the following signal sources.

Outputs of FT-instructions as signal sources for digital outputs *FT-Output 1* **1350** *FT-Output 2* **1351**		Op. Mode 530, 532 & 554 Non-negated	Negated
2401 - FT-Output Buffer 1		80	180
2402 - FT-Output Buffer 2	⟺	81	181
2403 - FT-Output Buffer 3		82	182
2404 - FT-Output Buffer 4		83	183

Example: Selection of signal source for digital output:
The output signal of function 15 (index 15 of function table) is to be output via digital output S1OUT.



Output 1 of function 15 must be defined as a general (global) signal source:

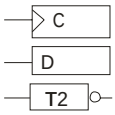
- The following can be set in index 15 of the function table: Parameter *FT-target output 1* **1350** = "2404 - FT-Output Buffer 4". As a result, the signal source is generally (globally) available for processing by other device functions and has the logic state of output 1 of function 15. It is also possible to choose another signal source from signal sources 2401 to 2404 for the parameter.

For a digital output, choose the general (global) signal source which contains output value 1 of FT-instruction 15:

- Parameter *Op. Mode Digital Output 1* **530 =** "83 - FT-Output Buffer 4" (according to signal source "FT-Output Buffer" set in parameter *FT-target output 1* **1350**).

4 Description of functions

In the following, you will find explanations and examples of the individual functions. In the examples, the standard links of the input buffer are used. You can also parameterize other settings for the individual instructions. The following symbols are used in the diagrams:



edge evaluation

level evaluation

negated output

0	"Low" state.
1	"High" state.
x	any state ("Don't care" – 0 or 1).
0 → 1	positive edge.
1 → 0	negative edge.
Q_{n-1}	last state is maintained.
$\overline{Q_{n-1}}$	last state is negated (toggle).
A_n	non-negated output
$\overline{A_n}$	negated output

Note: For better clarity, the non-negated output A_n is used in the descriptions. The negated output $\overline{A_n}$ is available in each function and can be used.

4.1 Boolean operations

The following table shows the linking of the implemented Boolean functions. Logic 0s are indicated as dots.

Inputs				Output depending on logic function			
E1	E2	E3	E4	AND	OR	XOR 1	XOR 1 || 3
.	.	.	.	.	.	.	.
.	.	.	**1**	.	**1**	**1**	**1**
.	.	**1**	.	.	**1**	**1**	**1**
.	.	**1**	**1**	.	**1**	.	.
.	**1**	.	.	.	**1**	**1**	**1**
.	**1**	.	**1**	.	**1**	.	.
.	**1**	**1**	.	.	**1**	.	.
.	**1**	**1**	**1**	.	**1**	.	**1**
1	.	.	.	.	**1**	**1**	**1**
1	.	.	**1**	.	**1**	.	.
1	.	**1**	.	.	**1**	.	.
1	.	**1**	**1**	.	**1**	.	**1**
1	**1**	.	.	.	**1**	.	.
1	**1**	.	**1**	.	**1**	.	**1**
1	**1**	**1**	.	.	**1**	.	**1**
1	**1**	**1**	**1**	**1**	**1**	.	.

4.1.1 AND link

FT-instruction **1343** = "1 - AND"

Description:
The inputs are AND-linked to one another. The inputs of the instruction are the signal sources assigned (ACU functions, digital inputs). Output is logic "1" if all inputs are logic "1". As soon as one input is logic "0", the output will be logic "0". The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Note: Unused inputs must be set to "6 - TRUE". For example, *FT-Input 3* **1346** and *FT-input 4* **1347** must be set to "6 - TRUE" if inputs *FT-input 1* **1344** and *FT-input 2* **1345** are to be AND-linked only.

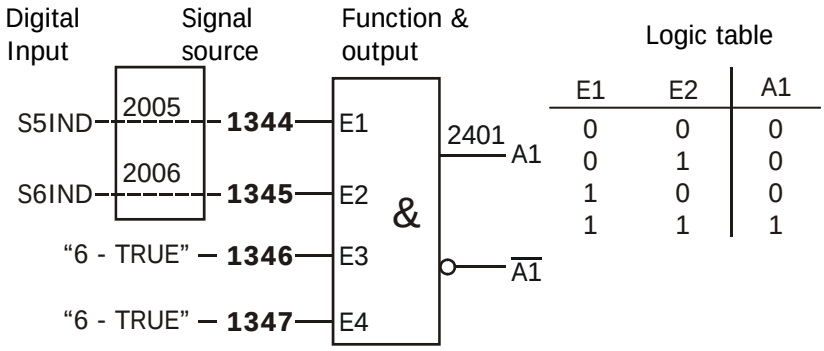
Example:
A1 =S5IND AND S6IND

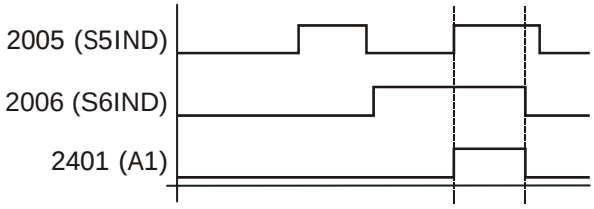
FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	..
	...	...	...	...	74-S5IND	75-S6IND	..

Settings in (i.e.) Index 1 of function table:

FT-instruction **1343** = „1 - AND“,
E1 *FT-input 1* **1344** = „2005 – Input buffer 5“,
E2 *FT-input 2* **1345** = „2006 – Input buffer 6“,
E3 *FT-Input 3* **1346** = „6 - TRUE“,
E4 *FT-input 4* **1347** = „6 - TRUE“,
A1 Not-negated output 2101
Optional: *FT-target output 1* **1350** = „2401 – Output buffer 1“.
$\overline{A1}$ Negated Output 2201
Optional: *FT-target output 2* **1351**

AND link





4.1.2 OR link

FT-instruction **1343** = "2 - OR"

Description:
The inputs are OR-linked to one another. The inputs of the instruction are the signal sources assigned (ACU functions, digital inputs). Output is logic "1" if at least one input is logic "1". If all inputs are logic "0", the output will be logic "0". The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Note: Unused inputs must be set to "7 - FALSE" (factory setting). For example, *FT-Input 3* **1346** and *FT-input 4* **1347** must be set to "7 - FALSE" if inputs *FT-input 1* **1344** and *FT-input 2* **1345** are to be OR-linked only.

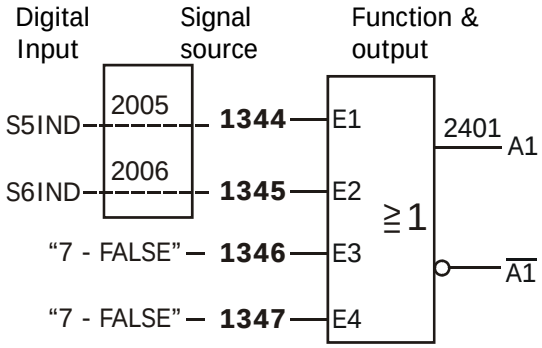
Example:
A1 =S5IND OR S6IND

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	..
	...	...	...	...	74-S5IND	75-S6IND	..

Settings in (i.e.) Index 3 of function table:

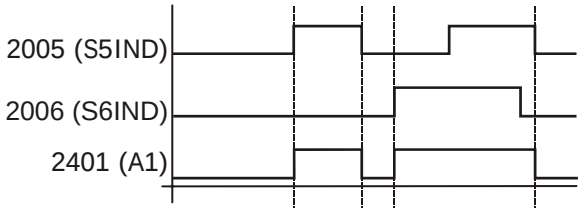
FT- Instruction **1343** = „2 – OR“,
E1 *FT-input 1* **1344** = „2005 - Input Buffer 5“,
E2 *FT-input 2* **1345** = „2006 - Input Buffer 6“,
E3 *FT-Input 3* **1346** = „7 - FALSE“,
E4 *FT-input 4* **1347** = „7 - FALSE“,
A1 Not-negated output 2103
Optional: *FT-target output 1* **1350** = „2401 – Output buffer 1“.
$\overline{A1}$ Negated Output 2203
Optional: *FT-target output 2* **1351**

OR link



Logic table

E1	E2	A1
0	0	0
0	1	1
1	0	1
1	1	1



4.1.3 XOR 1-link

FT-instruction **1343** = "3 - XOR 1"

Description:
The inputs are XOR-linked to one another. The inputs of the instruction are the signal sources assigned (ACU functions, digital inputs). Output is logic "1" if exactly one input is logic "1". The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

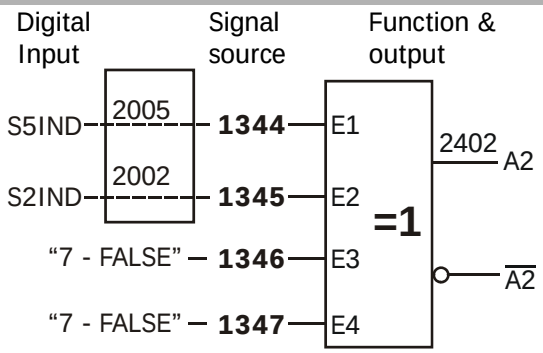
Example:
A1 =S5IND XOR S2IND

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	..
	...	71-S2IND	...	...	74-S5IND	...	..

Settings in (i.e.) Index 4 of function table:

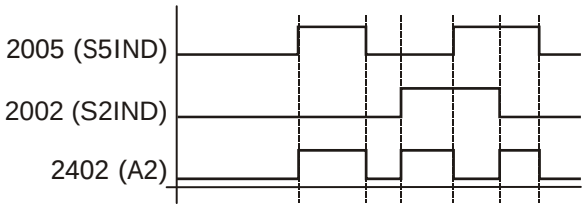
FT-instruction **1343** = „3 – XOR 1“,
E1 *FT-input 1* **1344** = „2005 – Input buffer 5“,
E2 *FT-input 2* **1345** = „2002 – Input buffer 2“,
E3 *FT-Input 3* **1346** = „7 - FALSE“,
E4 *FT-input 4* **1347** = „7 - FALSE“,
A2 Not-negated output 2104
Optional: *FT-target output 1* **1350** = „2402 – Output buffer 2“.
$\overline{A2}$ Negated Output 2204
Optional: *FT-target output 2* **1351**

XOR 1-link



Logic table

E1	E2	A2
0	0	0
0	1	1
1	0	1
1	1	0



4.1.4 XOR 1||3 link

FT-instruction **1343** = "4 - XOR 1||3"

Description:
The inputs are XOR-linked to one another. The inputs of the instruction are the signal sources assigned (ACU functions, digital inputs). The output is logic "1" only if logic "1" is present on an odd number of inputs. The output is logic "0" only if logic "1" is present on an even number of inputs. The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

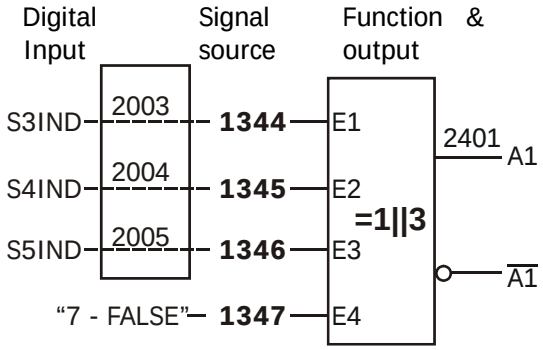
Example:
A1 =S3IND XOR S4IND XOR S5IND

FT- input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	..
	...	...	72-S3IND	73-S4IND	74-S5IND	...	..

Settings in (i.e.) Index 2 of function table:

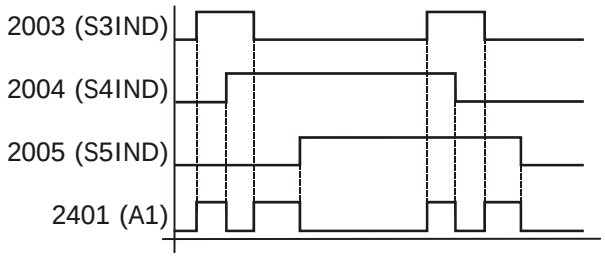
FT-instruction **1343** = „4 - XOR 1||3“,
E1 *FT-input 1* **1344** = „2003 – Input buffer 3“,
E2 *FT-input 2* **1345** = „2004 – Input buffer 4“,
E3 *FT-input 3* **1346** = „2005 – Input buffer 5“,
E4 *FT-input 4* **1347** = „7 - FALSE“,
A2 Not-negated output 2102
Optional: *FT-target output 1* **1350** = „2401 – Output buffer 1“.
$\overline{A2}$ Negated Output 2202
Optional: *FT-target output 2* **1351**

XOR 1||3 link



Logic table

E1	E2	E3	A1
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1



4.2 Flip-Flop types

4.2.1 RS-Flip-Flop, Superior

FT-instruction **1343** = "10 - RS-Flip-Flop"

Description:
Input 1 {Parameter *FT-input 1* **1344**} is the Set input.
Input 2 {Parameter *FT-input 2* **1345**} is the Reset input.
Input 3 {Parameter *FT-input 3* **1346**} is the Superior Set input.
Input 4 {Parameter *FT-input 4* **1347**} is the Superior Reset input.

The inputs of the instruction are the signal sources assigned in the input buffer (ACU functions, digital inputs).

Logic "1" on the Set input sets output on "1". Logic "1" on the Reset input sets output on "0". If logic "0" is present on both inputs, the current status of the output signal is maintained.
Logic "1" on the Superior Set input sets output on "1". Logic "1" on the Superior Reset input sets output on "0".

Priority:
Superior Reset (highest priority)
Superior Set
Reset
Set (lowest priority)

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Inputs Superior Set and Superior Reset are connected in series with the function. Levels at Set input E1 and Reset input E2 are processed internally. As soon as the Superior Set or Superior Reset is reset, the output is switched to the internally saved value.

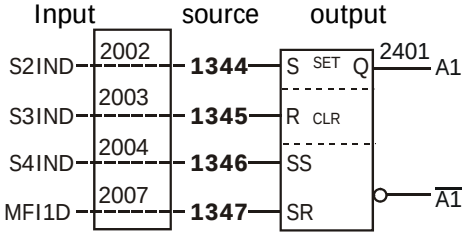
Example:
RS-Flip-Flop with Set=S2IND, Reset=S3IND, Sup.Set=S4IND, Sup.Reset=MFI1D

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	..
	...	71-S2IND	72-S3IND	73-S4IND	...	...	76-MFI1D	..

Settings in (i.e.) Index 2 of function table:

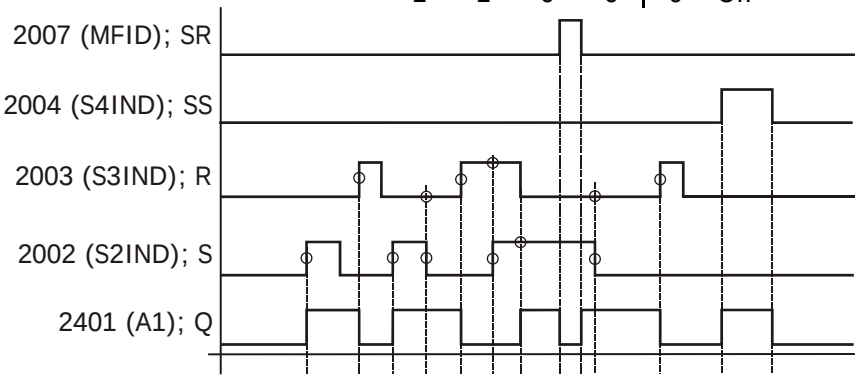
	FT-instruction **1343** = „10 - RS-Flip-Flop“,
S	*FT-input 1* **1344** = „2002 – Input buffer 2“,
R	*FT-input 2* **1345** = „2003 – Input buffer 3“,
SS	*FT-input 3* **1346** = „2004 – Input buffer 4“,
SR	*FT-input 4* **1347** = „2007 – Input buffer 7“,
A1	Not-negated output 2102
	Optional: *FT-target output 1* **1350** = „2401 – Output buffer 1“.
$\overline{A1}$	Negated Output 2202
	Optional: *FT-target output 2* **1351**

RS-Flip-Flop, Superior



Logic table

S	R	SS	SR	A1 Q	State
x	x	X	1	0	Off (Superior)
X	X	1	0	1	On (Superior)
0	0	0	0	Q_{n-1}	Hold
0	1	0	0	0	Reset
1	0	0	0	1	Set
1	1	0	0	0	Off



Set: If S-input {parameter *FT-input 1* **1344**} is logic "1", output 2401 is set to logic "1".
Save: If all inputs are logic "0", the output remains unchanged.
Reset: If R input becomes logic "1", the output is set to logic "0".
Off: If both inputs are set to logic "1", the output is logic "0".
Superior-Set: SS, set output to logic "1".
Superior-Reset: SR, set output to logic "0" (CLR).

4.2.2 RS-Flip-Flop, Master

FT-instruction **1343** = "110 - RS-Flip-Flop".

Description:
Input 1 {Parameter *FT-input 1* **1344**} is the Set input.
Input 2 {Parameter *FT-input 2* **1345**} is the Reset input.
Input 3 {Parameter *FT-input 3* **1346**} is the Master Set input[1)].
Input 4 {Parameter *FT-input 4* **1347**} is the Master Reset input[1)].

The inputs of the instruction are the signal sources assigned (ACU functions, digital inputs).

Logic "1" on the Set input sets output on "1". Logic "1" on the Reset input sets output on "0". If logic "0" is present on both inputs, the current status of the output signal is maintained.
Logic "1" on the Master Set input sets output on "1". Logic "1" on the Superior Reset input sets output on "0".

Priority:
Master Reset (highest priority)
Master Set
Reset
Set (lowest priority)

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Master Set and Master Reset are connected parallel with the function and change the state of the function as soon as the signal is present.

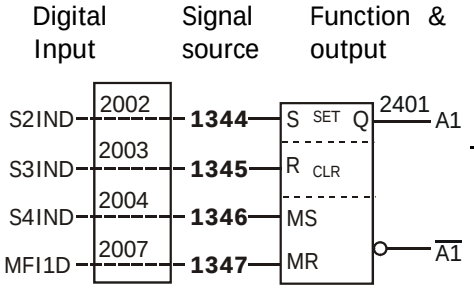
Example:
RS-Flip-Flop with Set=S2IND, Reset=S3IND, Master Set=S4IND, MasterReset=MFI1D

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	..
	...	71-S2IND	72-S3IND	73-S4IND	...	...	76-MFI1D	..

Settings in (i.e.) Index 10 of function table:

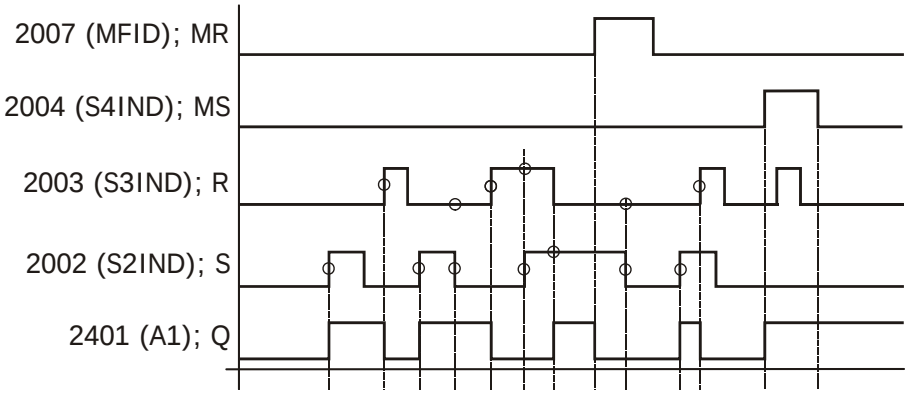
FT-instruction **1343** = „110 - RS-Flip-Flop“,
S *FT-input 1* **1344** = „2002 – Input buffer 2“,
R *FT-input 2* **1345** = „2003 – Input buffer 3“,
MS *FT-input 3* **1346** = „2004 – Input buffer 4“,
MR *FT-input 4* **1347** = „2007 – Input buffer 7“,
A1 Not-negated output 2110
Optional: *FT-target output 1* **1350** = „2401 – Output buffer 1“.
$\overline{A1}$ Negated Output 2210
Optional: *FT-target output 2* **1351**

RS-Flip-Flop, Master



Logic table

S	R	MS	MR	A1 Q	State
x	x	X	1	0	Off (Master)
X	X	1	0	1	On (Master)
0	0	0	0	Q_{n-1}	Hold
0	1	0	0	0	Reset
1	0	0	0	1	Set
1	1	0	0	0	Off



Set: If S-input {parameter *FT-input 1* **1344**} is logic "1", the output is set to logic "1".
Save: If all inputs are logic "0", the output remains unchanged.
Reset: If R input becomes logic "1", the output is set to logic "0".
Off: If both inputs are set to logic "1", the output is logic "0".
Master-Set: MS, set output to logic "1".
Master-Reset: MR, set output to logic "0" (CLR).

4.2.3 Toggle-Flip-Flop, Superior

FT-instruction **1343** = "20 - Toggle-Flip-Flop".

Description:
The output signal changes with positive clock edge T1 at input 1 or with negative clock edge T2 at input 2.

Logic "1" at Superior-Set input sets output "1". Logic "1" at Superior-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Inputs Superior Set and Superior Reset are connected in series with the function. Levels on T1- input E1 and T2 input E2 are processed internally. As soon as the Superior Set or Superior Reset is reset, the output is switched to the internally saved value.

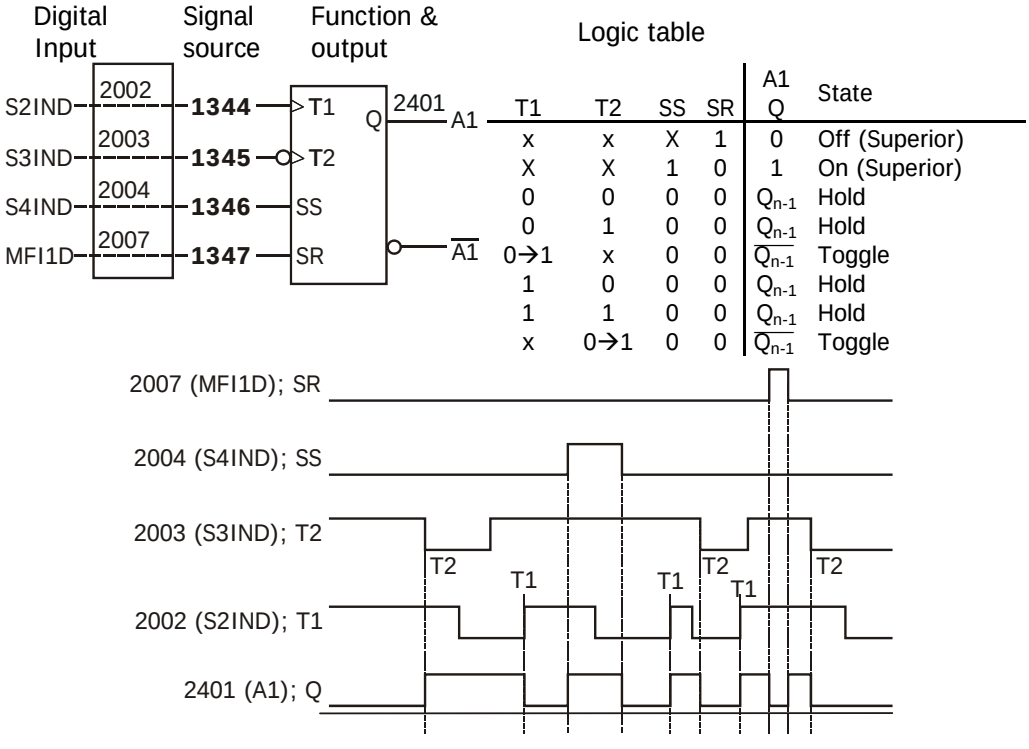
Example:
Toggle-Flip-Flop with T1=S2IND, T3=S3IND, Sup.Set=S4IND, Sup.Reset=MFI1D

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	..
	...	71-S2IND	72-S3IND	73-S4IND	...	...	76-MFI1D	..

Settings in (i.e.) Index 2 of function table:

FT-instruction **1343** = „20 - Toggle-Flip-Flop“,
S *FT-input 1* **1344** = „2002 – Input buffer 2“,
R *FT-input 2* **1345** = „2003 – Input buffer 3“,
SS *FT-input 3* **1346** = „2004 – Input buffer 4“,
SR *FT-input 4* **1347** = „2007 – Input buffer 7“,
A1 Not-negated output 2102
Optional: *FT-target output 1* **1350** = „2401 – Output buffer 1“.
$\overline{A1}$ Negated Output 2202
Optional: *FT-target output 2* **1351**

Toggle-Flip-Flop, Superior



Logic table

T1	T2	SS	SR	A1 Q	State
x	x	X	1	0	Off (Superior)
X	X	1	0	1	On (Superior)
0	0	0	0	Q_{n-1}	Hold
0	1	0	0	Q_{n-1}	Hold
0→1	x	0	0	$\overline{Q_{n-1}}$	Toggle
1	0	0	0	Q_{n-1}	Hold
1	1	0	0	Q_{n-1}	Hold
x	0→1	0	0	$\overline{Q_{n-1}}$	Toggle

4.2.4 Toggle-Flip-Flop, Master

FT-instruction **1343** = "120 - Toggle-Flip-Flop".

Description:
The output signal changes with positive clock edge T1 at input 1 or with negative clock edge T2 at input 2.

Logic "1" at Master-Set input sets output "1". Logic "1" at Master-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Master Set and Master Reset are connected parallel with the function and change the state of the function as soon as the signal is present.

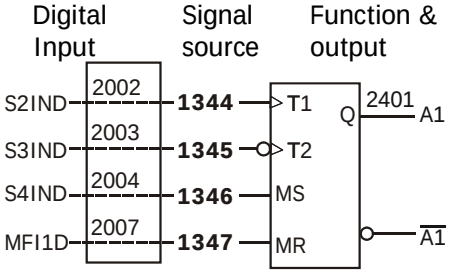
Example:
Toggle-Flip-Flop with T1=S2IND, T3=S3IND, MasterSet=S4IND, MasterReset=MFI1D

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	..
	...	71-S2IND	72-S3IND	73-S4IND	...	...	76-MFI1D	..

Settings in (i.e.) Index 12 of function table:

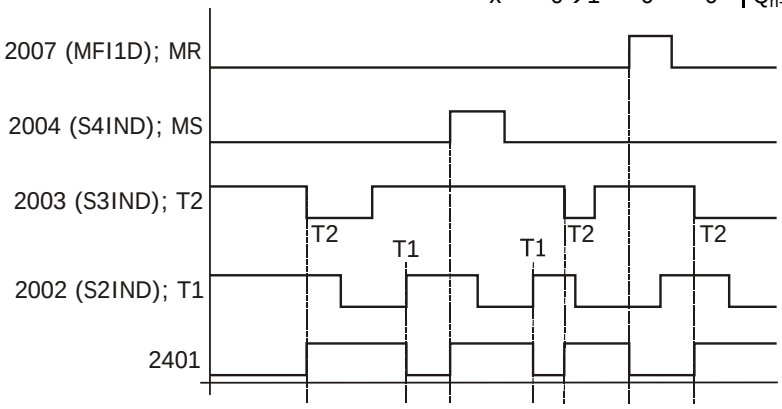
FT-instruction **1343** = „120 - Toggle-Flip-Flop“,
S *FT-input 1* **1344** = „2002 – Input buffer 2“,
R *FT-input 2* **1345** = „2003 – Input buffer 3“,
MS *FT-input 3* **1346** = „2004 – Input buffer 4“,
MR *FT-input 4* **1347** = „2007 – Input buffer 7“,
A1 Not-negated output 2112
Optional: *FT-target output 1* **1350** = „2401 – Output buffer 1“.
$\overline{A1}$ Negated Output 2212
Optional: *FT-target output 2* **1351**

Toggle-Flip-Flop, Master



Logic table

T1	T2	MS	MR	A1 Q	State
x	x	X	1	0	Off (Master)
X	X	1	0	1	On (Master)
0	0	0	0	Q_{n-1}	Hold
0	1	0	0	Q_{n-1}	Hold
0→1	x	0	0	$\overline{Q_{n-1}}$	Toggle
1	0	0	0	Q_{n-1}	Hold
1	1	0	0	Q_{n-1}	Hold
x	0→1	0	0	$\overline{Q_{n-1}}$	Toggle



4.2.5 D-Flip-Flop, Superior

FT-instruction **1343** = "30 - D-Flip-Flop".

Description:
If a positive edge is received at input 1 (clock pulse input C, Clock) the signal present at input 2 (data input D) is transferred to the output.

Logic "1" at Superior-Set input sets output "1". Logic "1" at Superior-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Inputs Superior Set and Superior Reset are connected in series with the function. Levels on C input E1 and D input E2 are processed internally. As soon as the Superior Set or Superior Reset is reset, the output is switched to the internally saved value.

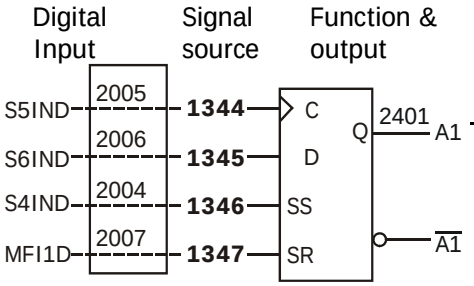
Example:
D-Flip-Flop with C=S5IND, D=S6IND, Sup.Set=S4IND, Sup.Reset=MFI1D

FT- input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	..
	...	...	...	73-S4IND	74-S5IND	75-S6IND	76-MFI1D	..

Settings in (i.e.) Index 21 of function table:

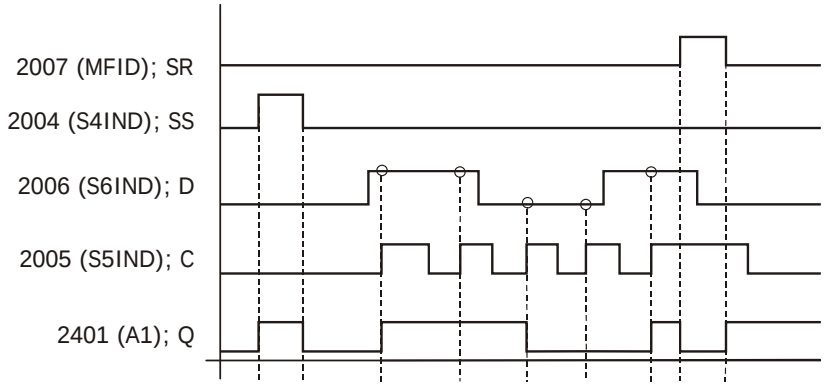
FT-instruction **1343** = „30 - D-Flip-Flop“,
C *FT-input 1* **1344** = „2005 – Input buffer 5“,
D *FT-input 2* **1345** = „2006 – Input buffer 6“,
SS *FT-input 3* **1346** = „2004 – Input buffer 4“,
SR *FT-input 4* **1347** = „2007 – Input buffer 7“,
A1 Not-negated output 2121
Optional: *FT-target output 1* **1350** = „2401 – Output buffer 1“.
$\overline{A1}$ Negated Output 2221
Optional: *FT-target output 2* **1351**

D-Flip-Flop, Superior



Logic table

C	D	SS	SR	A1 Q	State
x	x	x	1	0	Off (Superior)
x	x	1	0	1	On (Superior)
x	x	0	0	Q_{n-1}	Hold
0→1	0	0	0	0	Sample
0→1	1	0	0	1	Sample



4.2.6 D-Flip-Flop, Master

FT-instruction **1343** = "130 - D-Flip-Flop".

Description:
If a positive edge is received at input 1 (clock pulse input C, Clock) the signal present at input 2 (data input D) is transferred to the output.

Logic "1" at Superior-Set input sets output "1". Logic "1" at Superior-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Master Set and Master Reset are connected parallel with the function and change the state of the function as soon as the signal is present.

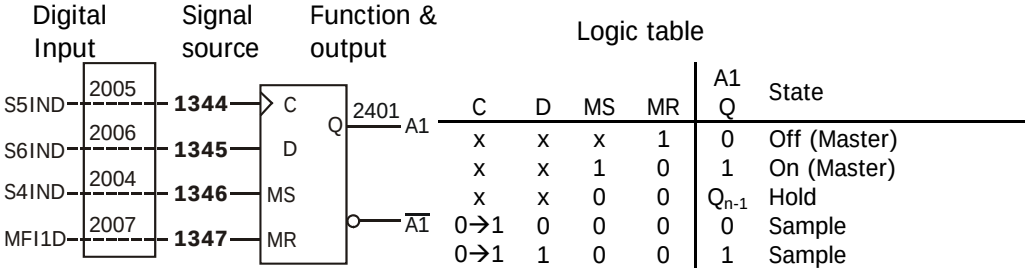
Example:
D-Flip-Flop with C=S5IND, D=S6IND, MasterSet=S4IND, MasterReset=MFI1D

FT- input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	..
	...	...	...	73-S4IND	74-S5IND	75-S6IND	76-MFI1D	..

Settings in (i.e.) Index 5 of function table:

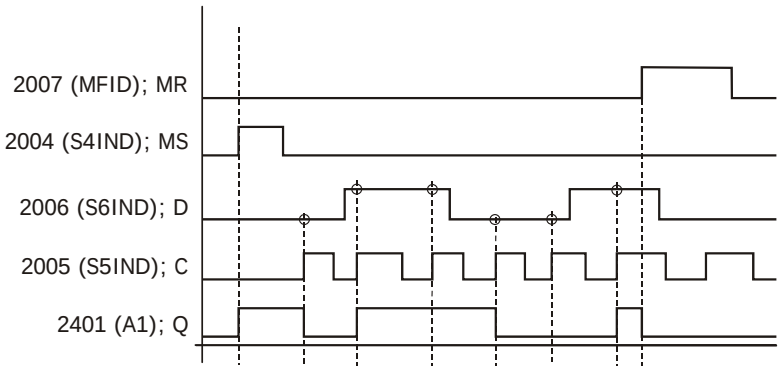
FT-instruction **1343** = „130 - D-Flip-Flop“,
C *FT-input 1* **1344** = „2002 – Input buffer 5“,
D *FT-input 2* **1345** = „2003 – Input buffer 6“,
MS *FT-input 3* **1346** = „2004 – Input buffer 4“,
MR *FT-input 4* **1347** = „2007 – Input buffer 7“,
A1 Not-negated output 2105
Optional: *FT-target output 1* **1350** = „2401 – Output buffer 1“.
$\overline{A1}$ Negated Output 2205
Optional: *FT-target output 2* **1351**

D-Flip-Flop, Master



Logic table

C	D	MS	MR	A1 Q	State
x	x	x	1	0	Off (Master)
x	x	1	0	1	On (Master)
x	x	0	0	Q_{n-1}	Hold
0→1	0	0	0	0	Sample
0→1	1	0	0	1	Sample

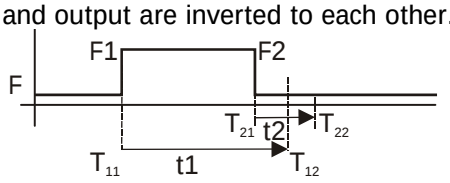


4.3 Delay

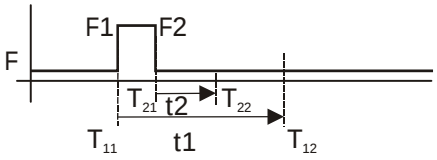
The delay can be used to delay the edges for a specified time. For the rising and the falling edge two separate timers are available.

If delay times differ in their length, this can result, that an edge F1 at the time T_{11} can have a later switching time T_{12} than the edge F2 at the time T_{21} with a switching time T_{22}. In this case no edge is switched at the output, because else it could happen, that input and output are inverted to each other.

$T_{22} > T_{12}$



$T_{22} < T_{12}$



The delays are implemented as „retriggerable“ and „not retriggerable“ version.

Retriggerable means, that an anew (same oriented) edge during the processing of the delay will start the delay again with a new calculated switching time for the edge (“last edge dominant”). The level of input and output is not used fort he calculation of the switching times.
„Retriggerable“ is the suitable choice, when several signals in short succession occur, from which only the last one should be processed or a continuous signal, where short pulse faults (“flicker”) can occur, which have to be filtered out. The level of input and output is not used fort he calculation of the switching times.

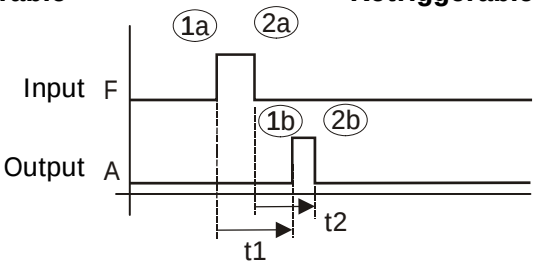
Not retriggerable means, that an anew (same oriented) edge during the processing of the delay is not started again, the original switching time is preserved (“first edge dominant”).
Not retriggerable is suited, when an edge should start a process, which operation is not to be interrupted until the delay is finished.

Note: The unit of the selected times is either millisecond [ms], second [s] or minute [min]. Internally the values are limited to 24 days.

Example 1 **1 Rectangle-Pulse**

Switching on time input (F): 500 ms
Delay time positive edge: 1000 ms
Delay time negative edge: 800 ms

Not retriggerable **Retriggerable**

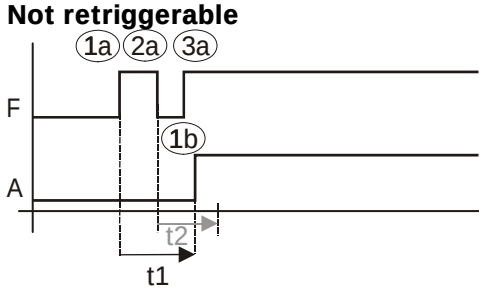


Edge 1a starts timer t1
Edge 2a starts timer t2
Edge 1b is output by t1 delayed (relating to 1a)
Edge 2b is output by t2 delayed (relating to 2a)

Example 2 **1 Rectangle-Pulse and following positive edge**

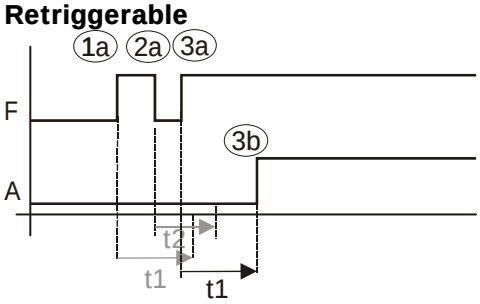
Switching on time input (F): 500 ms
Switching off time input (F): 350 ms
Delay time positive edge: 1000 ms (t1)
Delay time negative edge: 800 ms (t2)

Not retriggerable



1a starts timer t1
2a starts timer t2
1b is output by t1 delayed
3a (continuous signal) interrupts the execution of 2a

Retriggerable

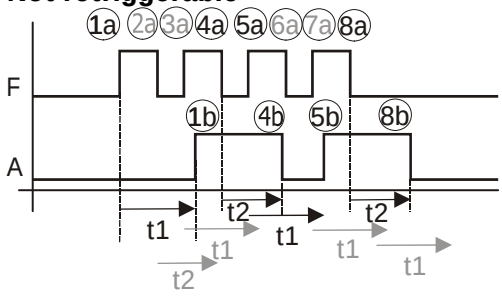


1a starts timer t1
2a starts timer t2
3a starts timer t1 anew (retrigger)
3b is output by t1 delayed (relating to 3a)

Example 3 **4 Rectangle-Pulses in succession**

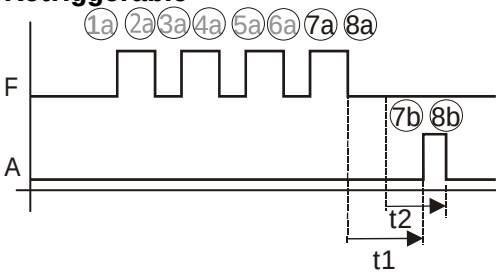
Switching times and delay times like in example 2

Not retriggerable



1a starts timer t1
2a starts timer t2
3a interrupts the execution of 2a
1b is output with t1 delayed
4a starts timer t2
5a starts timer t1
4b is output with t1 delayed
5a to 8b: Repetition from 2a

Retriggerable

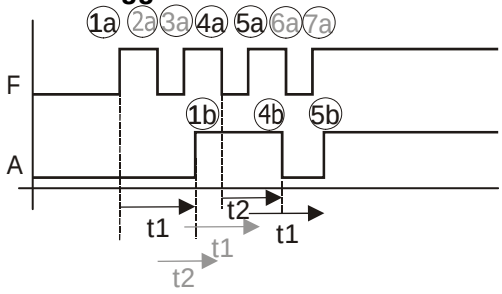


1a starts Timer t1
2a starts Timer t2
3a starts Timer t1 anew (retrigger)
4a starts Timer t2 anew (retrigger)
5a...6a starts Timer t1 und t2 anew
7b is output by t1 (relating to 7a)
8b is output by t2 (relating to 8a)

Example 4 **3 Rectangle-Pulses in succession and following positive edge**

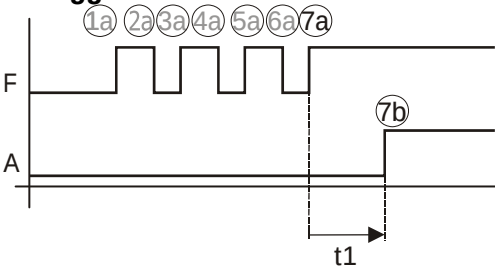
Switching times and delay times like in example 2

Not retriggerable



Processing like example 3. The positive edge 5a sets a high output. 6a and 7a follow in quick succession, so that these two edges are filtered out.

Retriggerable



Processing like example 3. The last positive edge 7a sets a high output.

4.3.1 Delay (retriggerable), Superior

FT-instruction **1343** = 40 [ms], 41 [s] or 42 [min]

Description:
The positive edge at Input 1 is delayed by t1 (*FT-parameter 1* **1348**), the negative edge is delayed by t2 (*FT-parameter 2* **1349**) before switching them through to the output. The delay time starts again with each edge.

Logic "1" at Superior-Set input sets output "1". Logic "1" at Superior-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Inputs Superior Set and Superior Reset are connected in series with the function. Levels at Input E1 are processed internally. As soon as the Superior Set or Superior Reset is reset, the output is switched to the internally saved value.

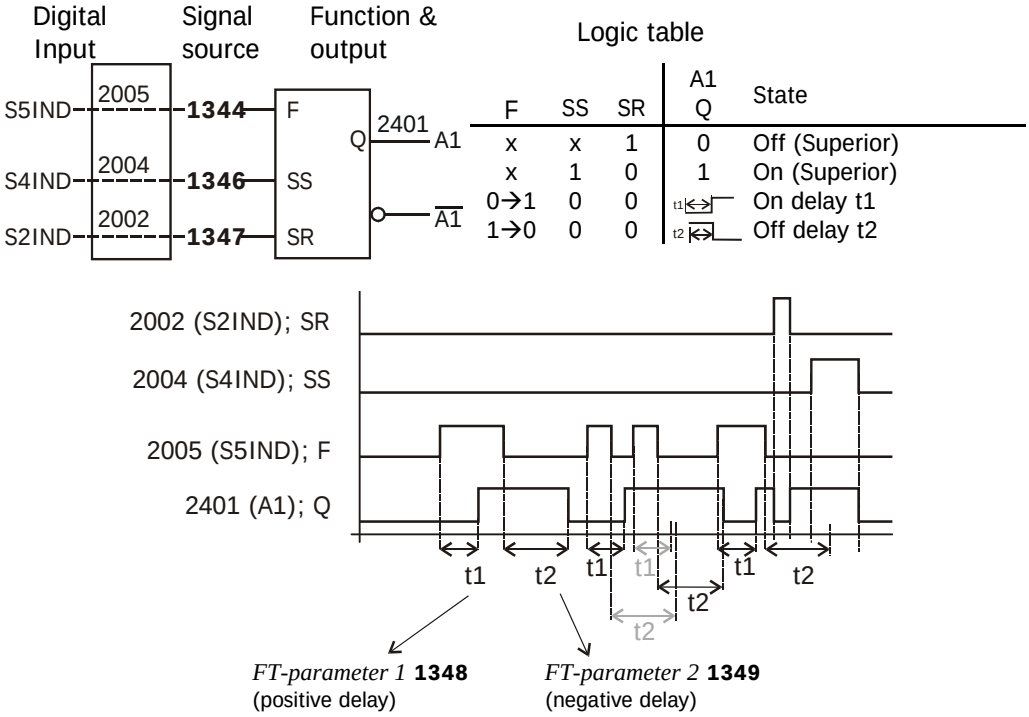
Example:
The edge of S2IND shall be delayed by 400 ms/800 ms.

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	..
	70-FI-release	71-S2IND	72-S3IND	73-S4IND	74-S5IND	...	..

Settings in (i.e.) Index 8 of function table:

FT-instruction **1343** = „40 - Delay“,
F *FT-input 1* **1344** = „2005 – Input buffer 5“,
SS *FT-input 3* **1346** = „2004 – Input buffer 4“,
SR *FT-input 4* **1347** = „2002 – Input buffer 2“,
P1 *FT-parameter 1* **1348** = 400
P2 *FT-parameter 2* **1349** = 800
A1 Not-negated output 2108
Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1“.
$\overline{A1}$ Negated output 2208
Optional: *FT-target output 2* **1351**

Delay (retriggerable), Superior



4.3.2 Delay (retriggerable), Master

FT-instruction **1343** = 140 [ms], 141 [s] or 142 [min]

Description:
The positive edge at Input 1 is delayed by t1 (*FT-parameter 1* **1348**), the negative edge is delayed by t2 (*FT-parameter 2* **1349**) before switching them through to the output. The delay time starts again with each edge.

Logic "1" at Master-Set input sets output "1". Logic "1" at Master-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Master Set and Master Reset are connected parallel with the function and change the state of the function as soon as the signal is present.

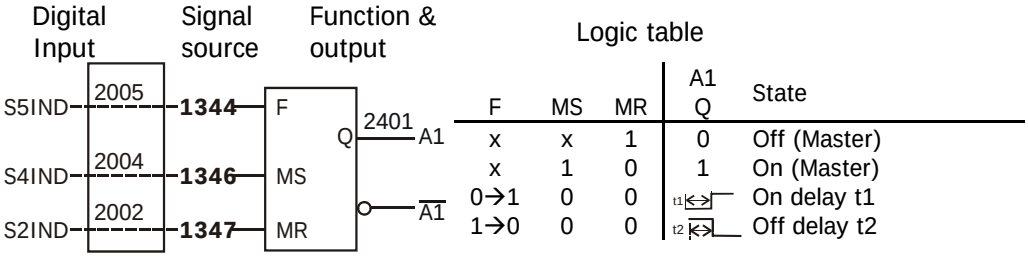
Example:
The edge of S2IND shall be delayed by 9 s/18 s.

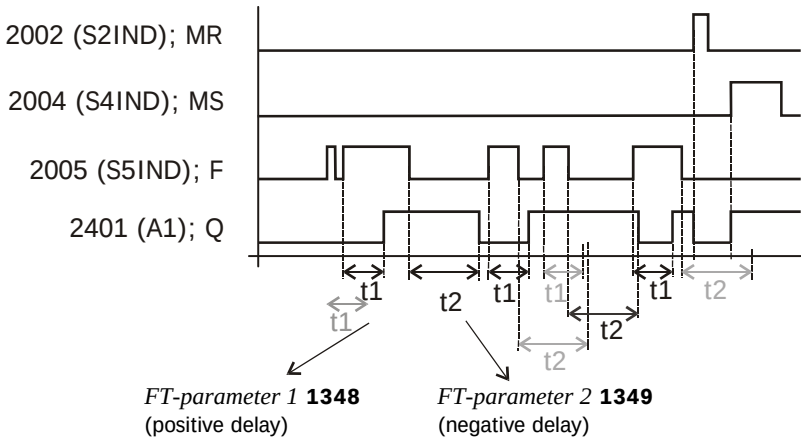
FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	..
	70-FI-release	71-S2IND	72-S3IND	73-S4IND	74-S5IND	...	..

Settings in (i.e.) Index 14 of function table:

FT-instruction **1343** = „141 - Delay“,
F *FT-input 1* **1344** = „2005 – Input buffer 5“,
MS *FT-input 3* **1346** = „2004 – Input buffer 4“,
MR *FT-input 4* **1347** = „2002 – Input buffer 2“,
P1 *FT-parameter 1* **1348** = 9
P2 *FT-parameter 2* **1349** = 18
A1 Not-negated output 2114
Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1“.
$\overline{A1}$ Negated output 2214
Optional: *FT-target output 2* **1351**

Delay (retriggerable), Master





4.3.3 Delay (non-retriggerable), Superior

FT-instruction **1343** = 50 [ms], 51 [s] or 52 [min]

Description:
The positive edge at Input 1 is delayed by t1 (*FT-parameter 1* **1348**), the negative edge is delayed by t2 (*FT-parameter 2* **1349**) before switching them through to the output. The delay time starts again with each edge.

Logic "1" at Master-Set input sets output "1". Logic "1" at Master-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Inputs Superior Set and Superior Reset are connected in series with the function. Levels at input E1 are processed internally. As soon as the Superior Set or Superior Reset is reset, the output is switched to the internally saved value.

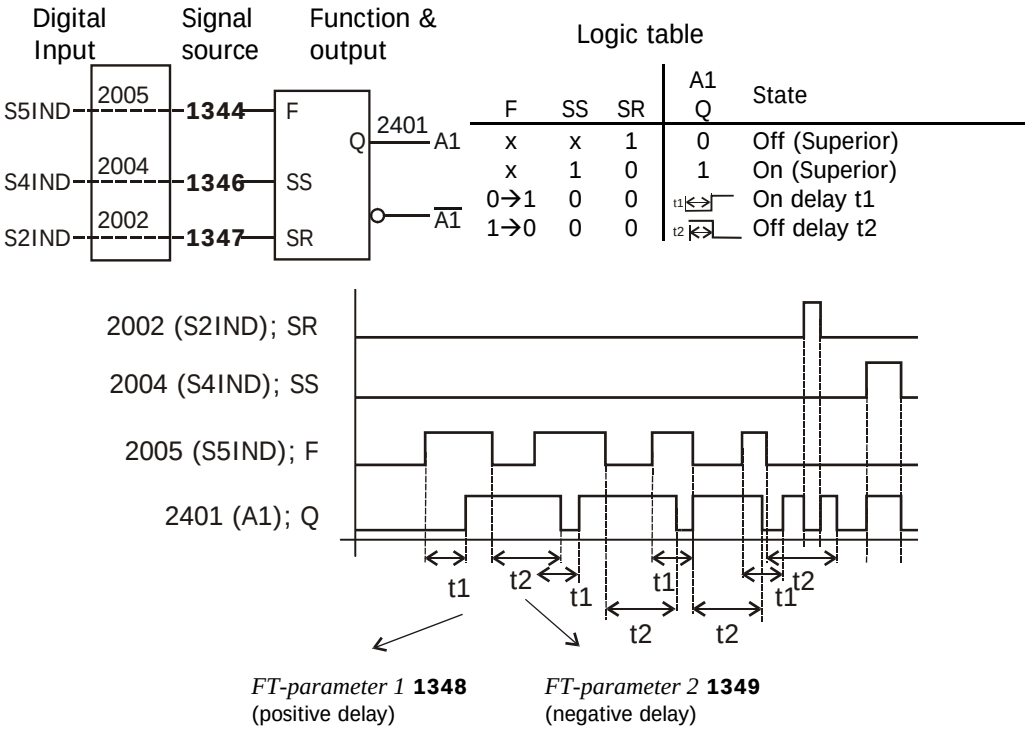
Example:
The edge of S2IND shall be delayed by 100 ms/200 ms.

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	..
	70-FI-release	71-S2IND	72-S3IND	73-S4IND	74-S5IND	...	..

Settings in (i.e.) Index 17 of function table:

	FT-instruction **1343** = „50 - Delay“,
F	*FT-input 1* **1344** = „2005 – Input buffer 5“,
SS	*FT-input 3* **1346** = „2004 – Input buffer 4“,
SR	*FT-input 4* **1347** = „2002 – Input buffer 2“,
P1	*FT-parameter 1* **1348** = 100
P2	*FT-parameter 2* **1349** = 200
A1	Not-negated output 2117
	Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1“.
$\overline{A1}$	Negated output 2217
	Optional: *FT-target output 2* **1351**

Delay (non-retriggerable), Superior



4.3.4 Delay (non-retriggerable), Master

FT-instruction **1343** = 150 [ms], 151 [s] or 152 [min]

Description:
The positive edge at Input 1 is delayed by t1 (*FT-parameter 1* **1348**), the negative edge is delayed by t2 (*FT-parameter 2* **1349**) before switching them through to the output. The delay time starts again with each edge.

Logic "1" at Master-Set input sets output "1". Logic "1" at Master-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Master Set and Master Reset are connected parallel with the function and change the state of the function as soon as the signal is present.

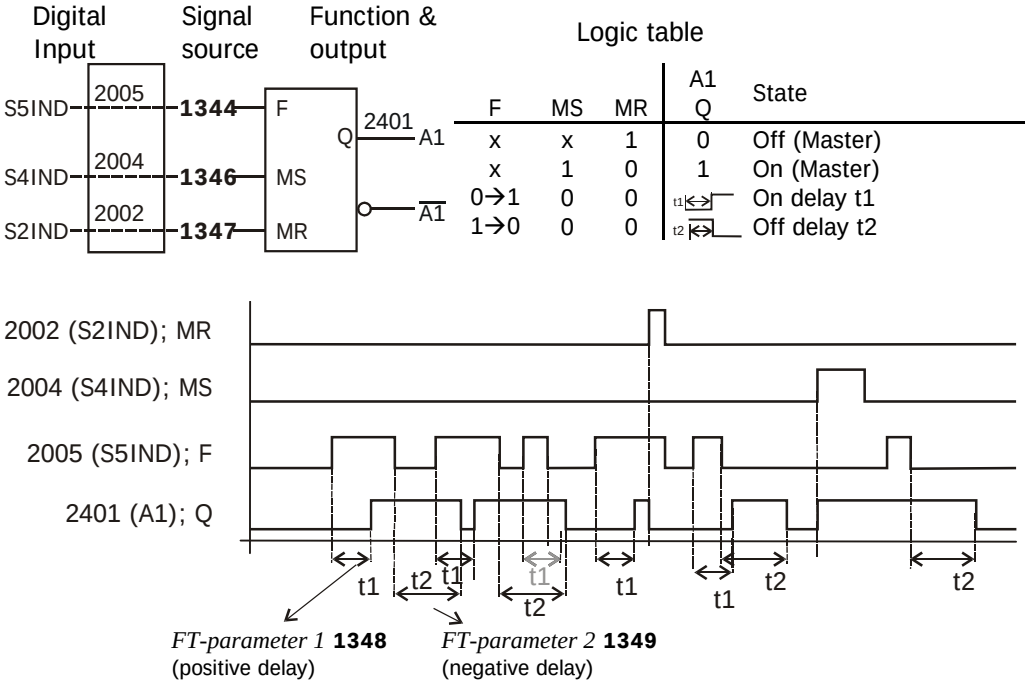
Example:
The edge of S2IND shall be delayed by 100 ms/50 ms.

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	..
	70-FI-release	71-S2IND	72-S3IND	73-S4IND	74-S5IND	...	..

Settings in (i.e.) Index 14 of function table:

FT-instruction **1343** = „150 - Delay“,
F *FT-input 1* **1344** = „2005 – Input buffer 5“,
MS *FT-input 3* **1346** = „2004 – Input buffer 4“,
MR *FT-input 4* **1347** = „2002 – Input buffer 2“,
P1 *FT-parameter 1* **1348** = 100
P2 *FT-parameter 2* **1349** = 50
A1 Not-negated output 2114
Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1“.
$\overline{A1}$ Negated output 2214
Optional: *FT-target output 2* **1351**

Delay (non-retriggerable), Master



4.4 Timer functions

4.4.1 Monoflop (retriggerable), Superior

FT-instruction **1343** = 60 [ms], 61 [s] or 62 [min]

Description:
The output signal becomes logical “1” with the positive edge of input 1 or the negative edge of input 2. The time set in *FT-parameter 1* **1348** is the On-Time (High) and the time set in *FT-parameter 2* **1349** is the Ignore-Edge-Time (Low). The delay time starts again with each edge.

Logic "1" at Superior-Set input sets output "1". Logic "1" at Superior-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

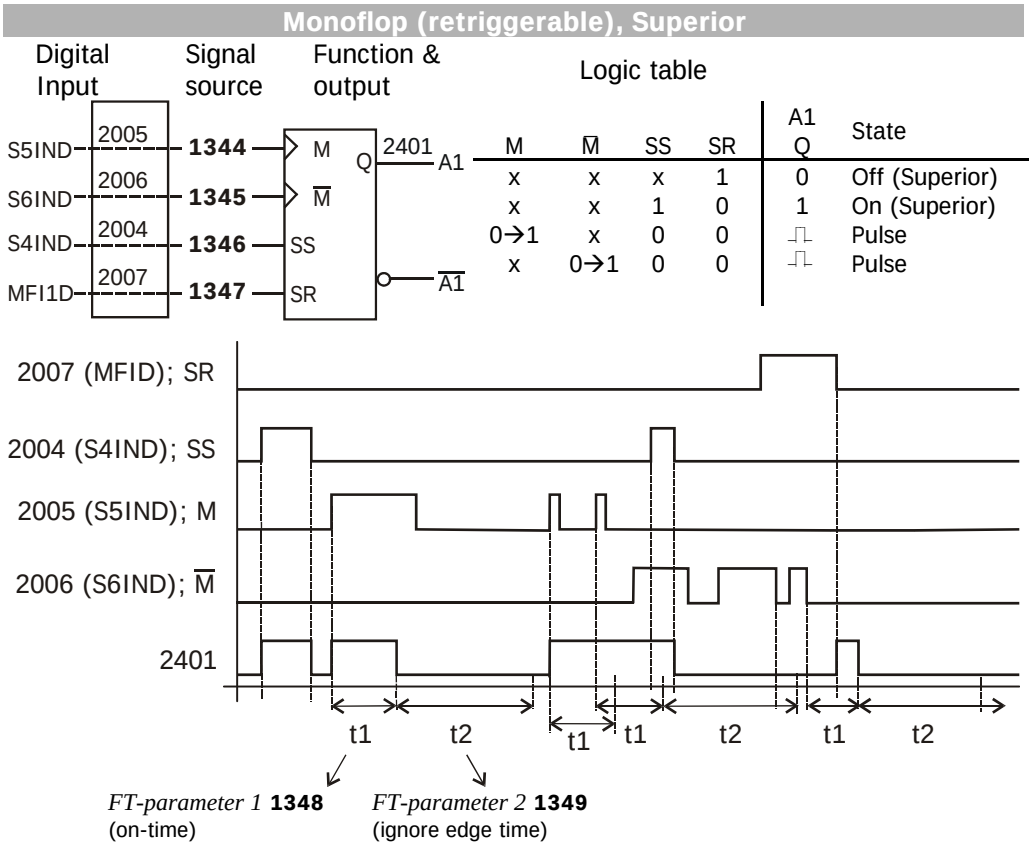
Inputs Superior Set and Superior Reset are connected in series with the function. Levels on Monoflop inputs E1 and E2 are processed internally. As soon as the Superior Set or Superior Reset is reset, the output is switched to the internally saved value.

Example:
The positive edge of S5IND or the negative edge of S6IND shall switch on the output for 200 ms. The “Out”-Time is 900 ms.

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	..
	...	...	...	73-S4IND	74-S5IND	75-S6IND	76-MFI1D	..

Settings in (i.e.) Index 5 of function table:

	FT-instruction **1343** = „60 – Monoflop [ms]“,
M	*FT-input 1* **1344** = „2005 – Input buffer 5“,
$\overline{M}$	*FT-input 2* **1345** = „2006 – Input buffer 6“,
SS	*FT-input 3* **1346** = „2004 – Input buffer 4“,
SR	*FT-input 4* **1347** = „2007 – Input buffer 7“,
P1	*FT-parameter 1* **1348** = 200
P2	*FT-parameter 2* **1349** = 900
A1	Not-negated output 2105 Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1“.
$\overline{A1}$	Negated output 2205 Optional: *FT-target output 2* **1351**



4.4.2 Monoflop (retriggerable), Master

FT-instruction **1343** = 160 [ms], 161 [s] or 162 [min]

Description:
The output signal becomes logical “1” with the positive edge of input 1 or the negative edge of input 2. The time set in *FT-parameter 1* **1348** is the On-Time (High) and the time set in *FT-parameter 2* **1349** is the Ignore-Edge-Time (Low). The delay time starts again with each edge.

Logic "1" at Master-Set input sets output "1". Logic "1" at Master-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Master Set and Master Reset are connected parallel with the function and change the state of the function as soon as the signal is present.

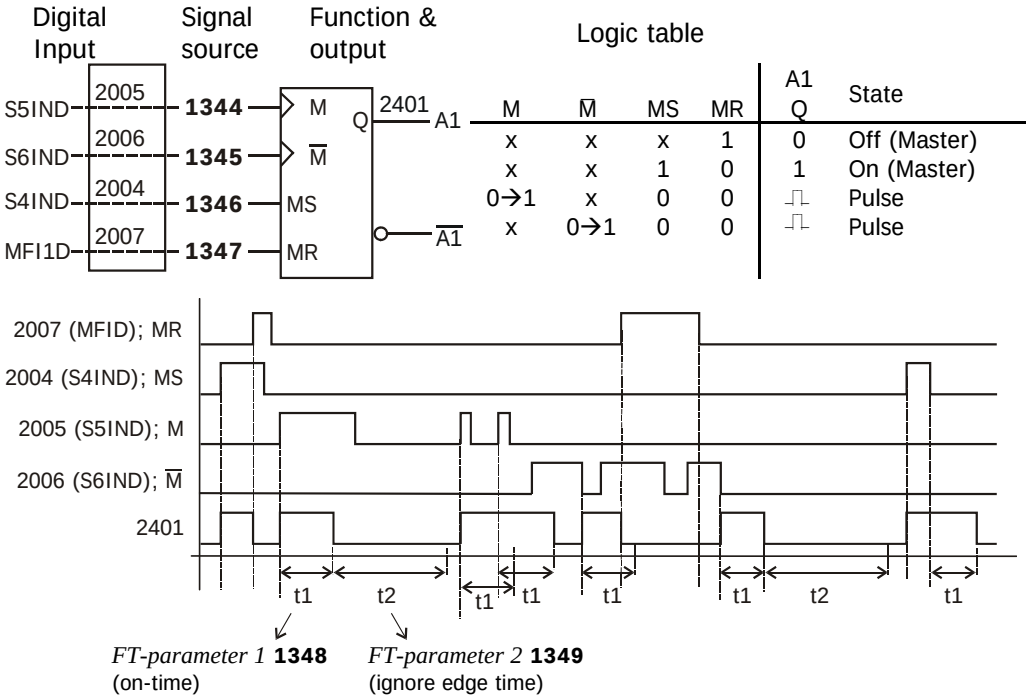
Example:
The positive edge of S5IND or the negative edge of S6IND shall switch on the output for 5 s. The “Out”-Time is 10 s.

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	..
	...	...	...	73-S4IND	74-S5IND	75-S6IND	76-MFI1D	..

Settings in (i.e.) Index 5 of function table:

FT-instruction **1343** = „161 – Monoflop [s]“,
M *FT-input 1* **1344** = „2005 – Input buffer 5“,
$\overline{M}$ *FT-input 2* **1345** = „2006 – Input buffer 6“,
MS *FT-input 3* **1346** = „2004 – Input buffer 4“,
MR *FT-input 4* **1347** = „2007 – Input buffer 7“,
P1 *FT-parameter 1* **1348** = 200
P2 *FT-parameter2* **1349** = 900
A1 Not-negated output 2105
Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1“.
$\overline{A1}$ Negated output 2205
Optional: *FT-target output 2* **1351**

Monoflop (retriggerable), Master



4.4.3 Monoflop (non-retriggerable), Superior

FT-instruction **1343** = 70 [ms], 71 [s] or 72 [min]

Description:
The output signal becomes logical “1” with the positive edge of input 1 or the negative edge of input 2. The time set in *FT-parameter 1* **1348** is the On-Time (High) and the time set in *FT-parameter 2* **1349** is the Ignore-Edge-Time (Low). The delay time starts again with each edge.

Logic "1" at Master-Set input sets output "1". Logic "1" at Master-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Inputs Superior Set and Superior Reset are connected in series with the function. Levels on toggle inputs E1 and E2 are processed internally. As soon as the Superior Set or Superior Reset is reset, the output is switched to the internally saved value.

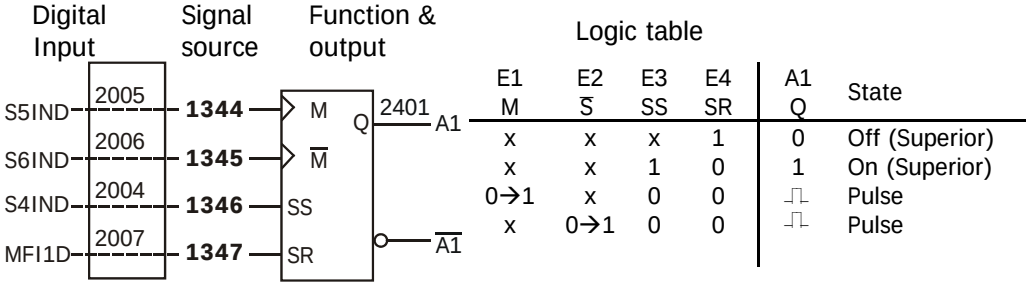
Example:
The positive edge of S5IND or the negative edge of S6IND shall switch on the output for 200 ms. The "Out"-Time is 900 ms.

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	..
	...	...	...	73-S4IND	74-S5IND	75-S6IND	76-MFI1D	..

Settings in (i.e.) Index 10 of function table:

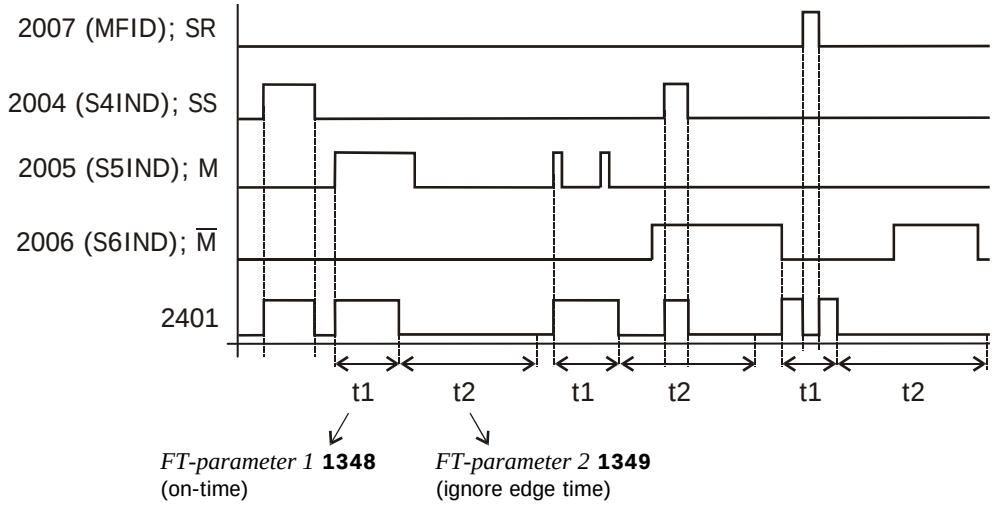
FT-instruction **1343** = „70 – Monoflop [ms]",
M *FT-input 1* **1344** = „2005 – Input buffer 5",
$\overline{M}$ *FT-input 2* **1345** = „2006 – Input buffer 6",
SS *FT-input 3* **1346** = „2004 – Input buffer 4",
SR *FT-input 4* **1347** = „2007 – Input buffer 7",
P1 *FT-parameter 1* **1348** = 200
P2 *FT-parameter2* **1349** = 900
A1 Not-negated output 2110
Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1".
$\overline{A1}$ Negated output 2210
Optional: *FT-target output 2* **1351**

Monoflop (non-retriggerable), Superior



Logic table

E1 M	E2 $\overline{S}$	E3 SS	E4 SR	A1 Q	State
x	x	x	1	0	Off (Superior)
x	x	1	0	1	On (Superior)
0→1	x	0	0	⎍	Pulse
x	0→1	0	0	⎍	Pulse



4.4.4 Monoflop (non-retriggerable), Master

FT-instruction **1343** = 170 [ms], 171 [s] or 172 [min]

Description:
The output signal becomes logical “1” with the positive edge of input 1 or the negative edge of input 2. The time set in *FT-parameter 1* **1348** is the On-Time (High) and the time set in *FT-parameter 2* **1349** is the Ignore-Edge-Time (Low). The delay time starts again with each edge.

Logic "1" at Master-Set input sets output "1". Logic "1" at Master-Reset input sets output "0".

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Master Set and Master Reset are connected parallel with the function and change the state of the function as soon as the signal is present.

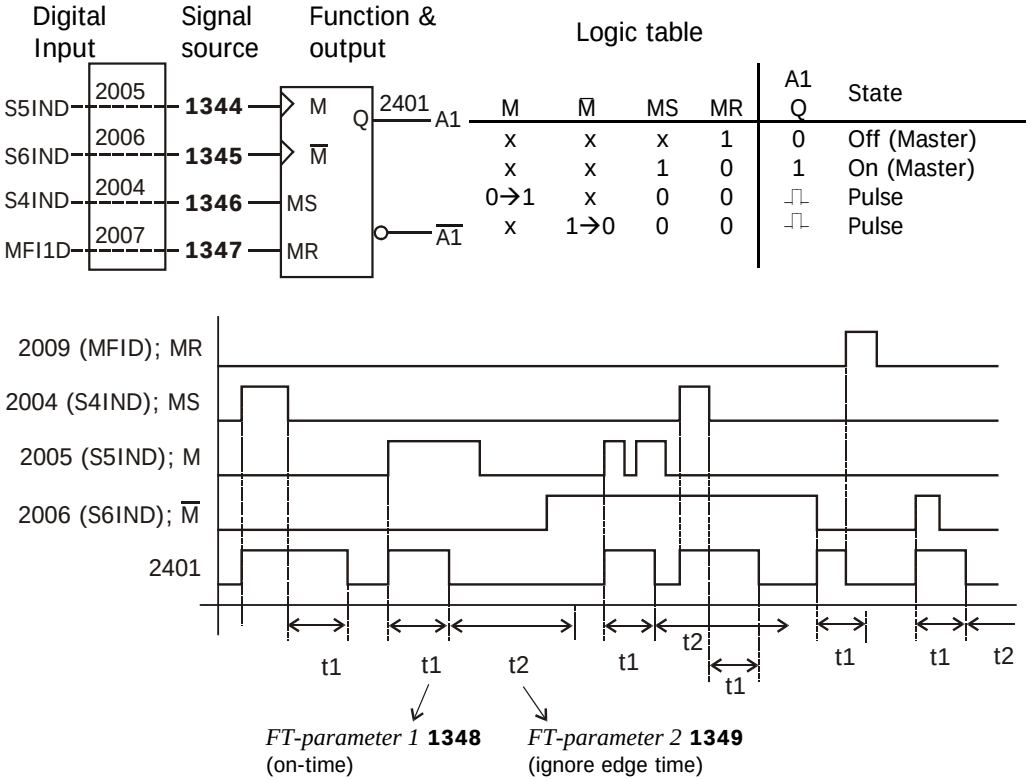
Example:
The positive edge of S5IND or the negative edge of S6IND shall switch on the output for 5 s. The “Out”-Time is 10 s.

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	...
	...	...	...	73-S4IND	74-S5IND	75-S6IND	76-MFI1D	...

Settings in (i.e.) Index 8 of function table:

	FT-instruction **1343** = „171 – Monoflop [s]“,
M	*FT-input 1* **1344** = „2005 – Input buffer 5“,
$\overline{M}$	*FT-input 2* **1345** = „2006 – Input buffer 6“,
MS	*FT-input 3* **1346** = „2004 – Input buffer 4“,
MR	*FT-input 4* **1347** = „2007 – Input buffer 7“,
P1	*FT-parameter 1* **1348** = 5
P2	*FT-parameter 2* **1349** = 10
A1	Not-negated output 2108 Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1“.
$\overline{A1}$	Negated output 2208 Optional: *FT-target output 2* **1351**

Monoflop (non-retriggerable), Master



4.4.5 Clock generator, Superior

FT-instruction **1343** = 80 [ms], 81 [s] or 82 [min]

Description:
As long as Input 1 is logic "1" and Input 2 is logic "0", the set pulse pattern is output. The pulse pattern at the output always starts with logic "1". The clock pattern is defined by the on-time and the off-time. The time set in *FT-parameter 1* **1348** is the on-time (High) and the time set in *FT-parameter 2* **1349** is the off-time (Low).

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Inputs Superior Set and Superior Reset are connected in series with the function. Levels at Set input E1 and Reset input E2 are processed internally. As soon as the Superior Set or Superior Reset is reset, the output is switched to the internally saved value.

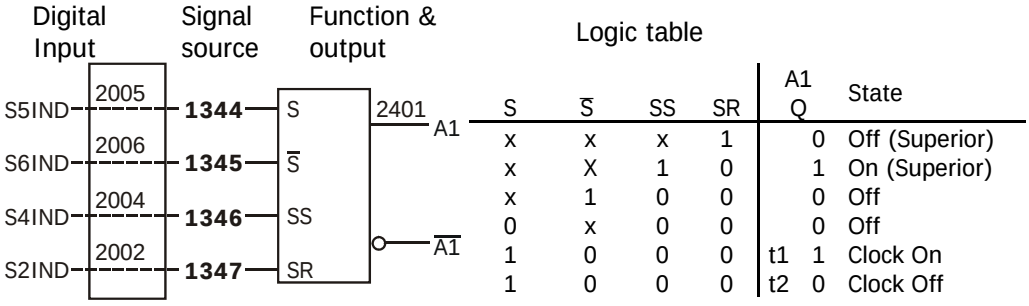
Example: If S5IND=„1“ and S6IND=„0“ → Pulse 100 ms on, 150 ms off.

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	..
	70-FI-release	71-S2IND	72-S3IND	73-S4IND	74-S5IND	74-S6IND	..

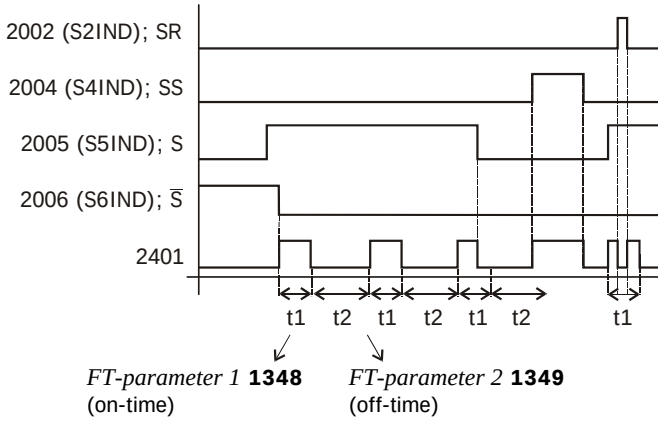
Settings in (i.e.) Index 6 of function table:

FT-instruction **1343** = „80 – Clock generator [ms]“,
S *FT-input 1* **1344** = „2005 – Input buffer 5“,
$\overline{S}$ *FT-input 2* **1345** = „2006 – Input buffer 6“,
SS *FT-input 3* **1346** = „2004 – Input buffer 4“,
SR *FT-input 4* **1347** = „2002 – Input buffer 2“,
P1 *FT-parameter 1* **1348** = 100
P2 *FT-parameter 2* **1349** = 150
A1 Not-negated output 2106
Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1“.
$\overline{A1}$ Negated output 2206
Optional: *FT-target output 2* **1351**

Clock generator



S	$\overline{S}$	SS	SR	A1 Q	State
x	x	x	1	0	Off (Superior)
x	X	1	0	1	On (Superior)
x	1	0	0	0	Off
0	x	0	0	0	Off
1	0	0	0	t1 1	Clock On
1	0	0	0	t2 0	Clock Off



4.4.6 Clock generator, Master

FT-instruction **1343** = 180 [ms], 181 [s] or 182 [min]

Description:
As long as Input 1 is logic "1" and Input 2 is logic "0", the set pulse pattern is output. The pulse pattern at the output always starts with logic "1". The clock pattern is defined by the on-time and the off-time. The time set in *FT-parameter 1* **1348** is the on-time (High) and the time set in *FT-parameter 2* **1349** is the off-time (Low).

The output signal can be used within the function table not-negated (21xx) and negated (22xx). The output signal is available via parameter *FT-target output 1* **1350**. Via parameter *FT-target output 2* **1351**, the inverted output signal is available.

Master Set and Master Reset are connected parallel with the function and change the state of the function as soon as the signal is present.

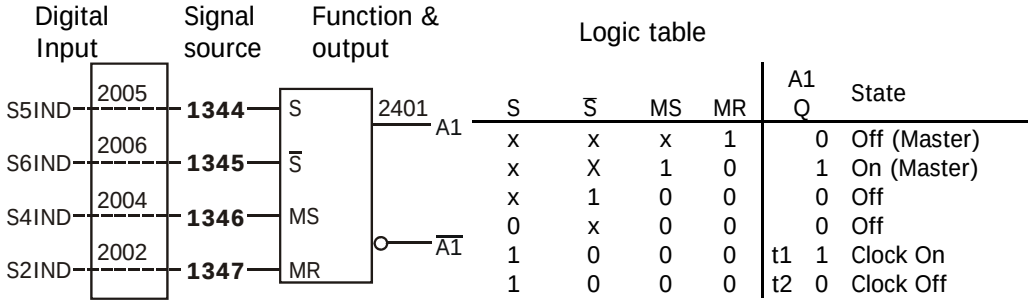
Example: If S5IND=„1“ and S6IND=„0“ → Pulse 100 ms on, 150 ms off.

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	...
	70-FI-release	71-S2IND	72-S3IND	73-S4IND	74-S5IND	74-S6IND	...

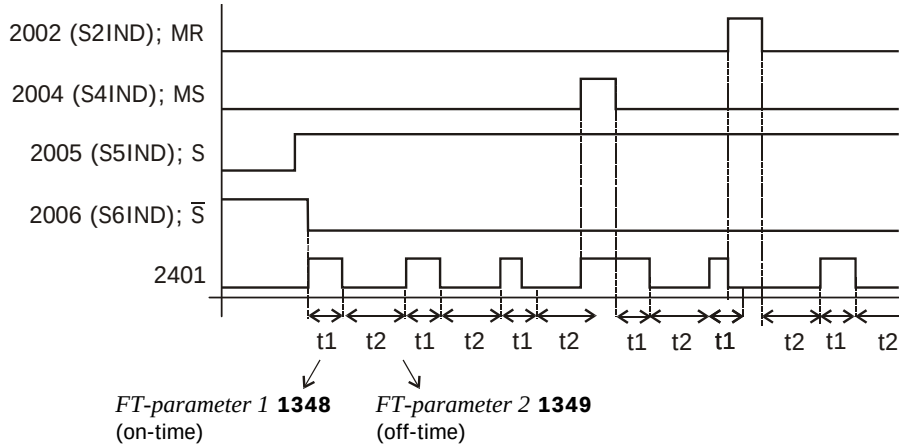
Settings in (i.e.) Index 6 of function table:

FT-instruction **1343** = „180 – Clock generator [ms]“,
S *FT-input 1* **1344** = „2005 – Input buffer 5“,
$\overline{S}$ *FT-input 2* **1345** = „2006 – Input buffer 6“,
MS *FT-input 3* **1346** = „2004 – Input buffer 4“,
MR *FT-input 4* **1347** = „2002 – Input buffer 2“,
P1 *FT-parameter 1* **1348** = 100
P2 *FT-Parameter2* **1349** = 150
A1 Not-negated output 2106
Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1“.
$\overline{A1}$ Negated output 2206
Optional: *FT-target output 2* **1351**

Clock generator, Master



S	$\overline{S}$	MS	MR	A1 Q	State
x	x	x	1	0	Off (Master)
x	X	1	0	1	On (Master)
x	1	0	0	0	Off
0	x	0	0	0	Off
1	0	0	0	t1 1	Clock On
1	0	0	0	t2 0	Clock Off



4.5 Digital Multiplexor (Data set number)

FT-instruction **1343** = "90 - Digital Multiplexor (Data set number)"

Description:
Depending on the current data set, the input values are passed on to the output values.

In actual values, you can read: *Active Data Set* **249** = 1.
The signal at digital input S31ND is taken over in the signal source "2401 - FT-output buffer 1". Signal "2401 - FT-output buffer 1" can be output via a digital output or processed by other functions.

Example:
When data set 1 is active, the value of S5IND is set to the output.
When data set 2 is active, the value of S3IND is set to the output.
When data set 3 is active, the value of EM-S1IND is set to the output.
When data set 4 is active, the value of EM-S2IND is set to the output.

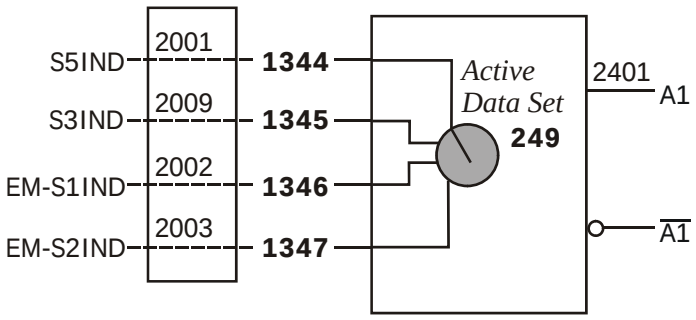
FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 9
	74-S5IND	320-EM-S1IND	321-EM-S2IND	72-S3IND

Settings in (i.e.) Index 6 of function table:

FT-instruction **1343** = „"90 - Digital Multiplexor (Data set number)",
E1 *FT-input 1* **1344** = „2001 – Input buffer 1“,
E2 *FT-input 2* **1345** = „2009 – Input buffer 9“,
E3 *FT-input 3* **1346** = „2002 – Input buffer 2“,
E4 *FT-input 4* **1347** = „2003 – Input buffer 3“,
A1 Not-negated output 2106
Optional: *FT-target output 1* **1350** = „2401 - FT-Output buffer 1“.
$\overline{A1}$ Negated output 2206
Optional: *FT-target output 2* **1351**

Digital Multiplexor (Data Set Number)

Active Data Set **249**	2401
1	E1
2	E2
3	E3
4	E4



4.6 Switch Data Set

FT-instruction **1343** = "91 - Switch Data Set"

Description:
A data set is selected via the input values.

Switch Data Set				
FT-input 1 **1344**	*FT-input 2* **1345**	*FT-input 3* **1346**	*FT-input 4* **1347**	Data Set
1	x	x	x	1
0	1	x	x	2
0	0	1	x	3
0	0	0	1	4
0	0	0	0	Data set via contacts

4.7 Jump function

FT-instruction **1343** = "100 - Jump function"

Description:
This function enables jumps in the sequence of the function table to other instructions.

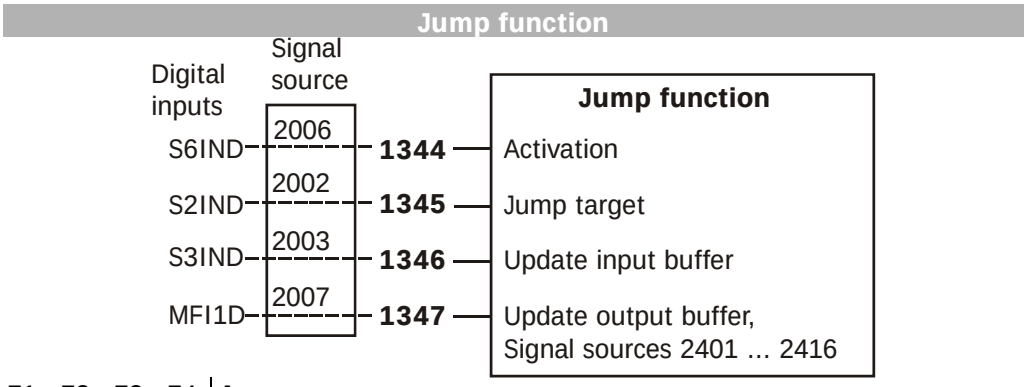
Activation
Input 1 {Parameter *FT-input 1* **1344**} activates the jump function.
- Input 1 = logic 1: jump function is executed
- Input 1 = logic 0: jump function is not executed

Jump target
Input 2 {parameter *FT-input 2* **1345**} defines the jump target.
- Input 2 = logic 1: Jump to function set in parameter *FT-parameter 1* **1348**
- Input 2 = logic 0: Jump to function set in parameter *FT-parameter 2* **1349**

Updating of input buffer
Logic 1 at input 3 {parameter *FT-input 3* **1346**} updates the input buffer. The values of the digital inputs and signal sources in the input buffer {parameter *FT-input buffer* **1362**} are updated.

Updating of output buffer (output buffer values)
Logic 1 on Input 4 {parameter *FT-input 4* **1347**} updates the values of output signals "2401 - FT-Output buffer 1" to "2416 - FT-output buffer 16". The updated values are available to digital outputs (e.g. S1OUT) and functions linked to FT-instruction outputs (e.g. Start Clockwise, Switch Data Set).

Example:
FT-instruction **1343** = 100 - Jump function



E1	E2	E3	E4	Jump
0	x	x	x	Jump to next instruction (index I + 1)
1	1	x	x	Jump to instruction set in *FT-parameter 1* **1348.**
1	0	x	x	Jump to instruction set in *FT-parameter 2* **1349.**

E1	E2	E3	E4	Update
x	x	1	x	Update input buffer (2001 ... 2016).
x	x	x	1	Update output buffer (2401 ... 2416).

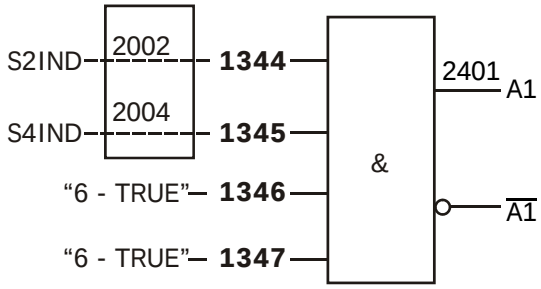
Note: At first, the output buffer is written and the input buffer is set. Then, the jump event is evaluated (based on the updated buffers) and executed.

5 Examples

5.1 Example 1: Linking two digital outputs

Digital signals S2IND and S4IND are to control digital output S1OUT. If both signals are present, the output is on. If not, the output is off.

Settings in index 1 of function table:
FT-instruction **1343** = "1 - AND",
FT-input 1 **1344** = "2002 - Input Buffer 2",
FT-input 2 **1345** = "2004 - Input Buffer 4",
FT-input 3 **1346** = "6 - TRUE",
FT-input 4 **1347** = "6 - TRUE",
FT-target output 1 **1350** = "2401 - FT-Output Buffer 1".



Settings in parameter group digital outputs:
Op. Mode Digital Output 1 **530** = "80 - FT-Output Buffer 1".

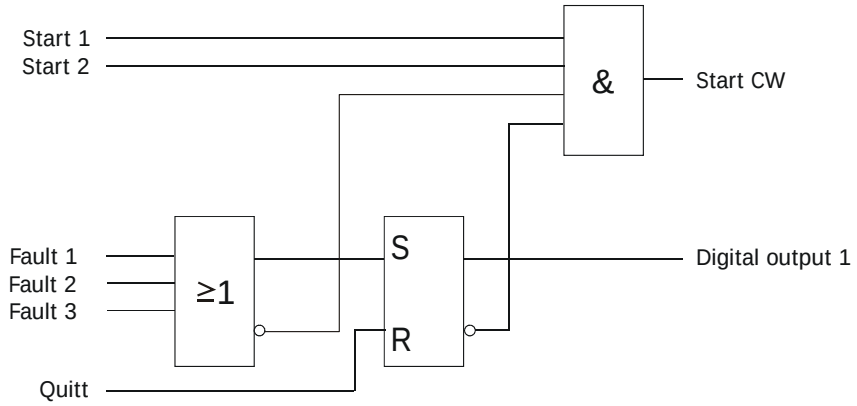
5.2 Example 2: Linking several FT-instructions

Note: The FT-instructions will be processed column by column according to the index in the table.
When designing application-specific logic links, in particular in the case of time-critical applications:
- Make sure to follow the correct order of the FT-instructions.
- Note the processing time (1 ms per FT-instruction).

Example of parameterization of FT-instructions in a function table:

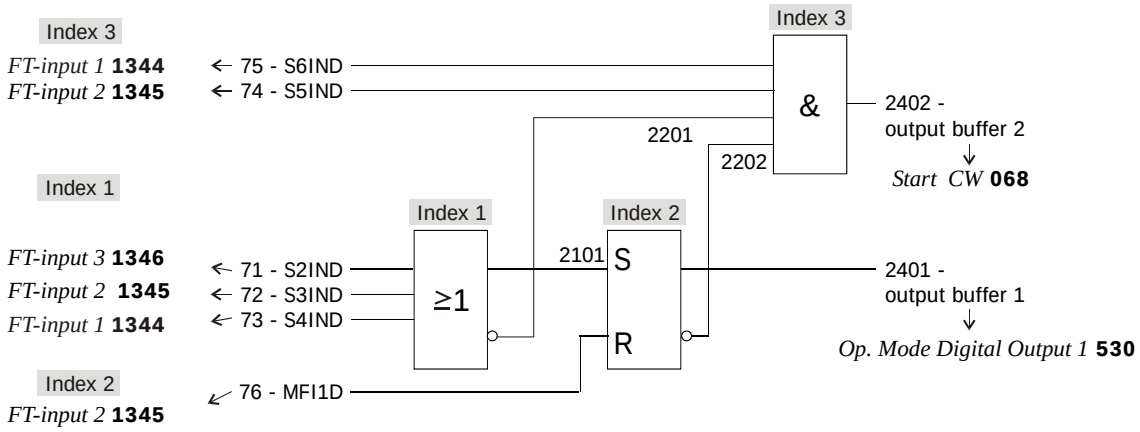
Step 1: Task
The drive may only start if both start signals (Start 1 and Start 2) are present and no error is present.
As soon as one of the two start signals (either Start 1 or Start 2) is no longer set, the drive is to be stopped.
If one of three error messages (error 1, error 2 or error 3) is present, the drive is to be stopped.
The acknow. input (Quitt) is used for acknowledging the error messages.
Any error condition that may be present is to be signaled on digital output 1.

Step 2: Logic plan



Step 3: Linking to and making entries in function table VTable

- Link FT-instruction outputs to FT-instruction inputs in function table VTable
- Make FT-instruction outputs generally (globally) available via signal sources "2401 - FT-Output buffer 1" to "2416 FT-Output buffer 16" and link them to other functions (no FT-instructions)
- Make output signals of FT-instruction outputs generally (globally) available via signal sources "2401 - FT-Output buffer 1" to "2416 FT-Output buffer 16" and output them via a digital output.



VTable

Function table input buffer	Index 2	Index 3	Index 4	Index 5	Index 6	Index 9
FT-input buffer **1362**	71 - S2IND	72 - S3IND	73 - S4IND	74 - S5IND	75 - S6IND	76 - MFI1D

Function table	Index 1	Index 2	Index 3
FT-instruction **1343**	2 - OR	10 - RS-Flip-Flop	1 - AND
FT-input 1 **1344**	2004	2101	2006
FT-input 2 **1345**	2003	2009	2005
FT-input 3 **1346**	2002		2201
FT-input 4 **1347**			2202
FT-output 1 **1350**		2402	2401
FT-output 2 **1351**			

VPlus

Start CW **068**	= 2402 - output buffer 2
Op. Mode Digital Output 1 **530**	= 80 - output buffer 1

Function table	Index 1	Index 2	Index 3	Index 4
FT-instruction **1343**	2 - OR	10 - RS-Flip-Flop	1 - AND	0 - Off (last table item)
FT-input 1 **1344**	2004 - Input Buffer 4	2101 - A1 Table Function 1	2006 - Input Buffer 6	7 - Off
FT-input 2 **1345**	2003 - Input Buffer 3	2009 - Input Buffer 9	2005 - Input Buffer 5	7 - Off
FT-input 3 **1346**	2002 - Input Buffer 2	7 - Off	2201 - A2 Table function 1[1)]	7 - Off
FT-input 4 **1347**	7 - Off	7 - Off	2202 - A2 Table function 2 [2)]	7 - Off
FT-target output1 **1350**	0 - Output not usable globally	2402 - FT-Output buffer 2	2401 - FT-Output buffer 1	0 - Output not usable globally
FT-target output 2 **1351**	0 - Output not usable globally	0 - Output not usable globally	0 - Output not usable globally	0 - Output not usable globally

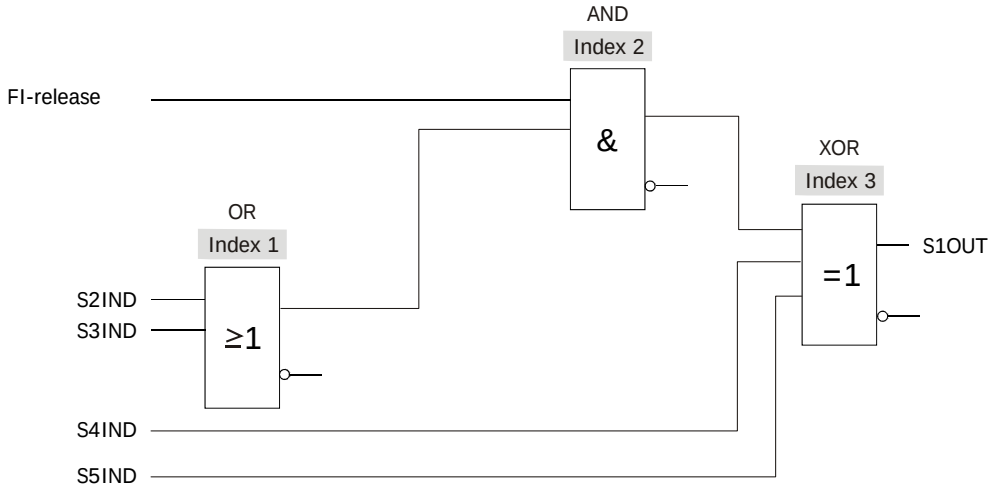
[1)] Inverted output of function 1 (in this example of OR function)
[2)] Inverted output of function 2 (in this example of RS-Flip-Flop)

The outputs of the FT-instructions are available as sources and can be linked to the inputs of other functions or output via digital outputs.

Example:

- Linking of AND function output with Start Clockwise Function, parameter *Start Clockwise* **068** = "2402 – FT Output Buffer 2"
- Linking of RS-Flip-Flop output with digital output 1; Parameter *Operation mode digital output 1* **530** = "80 – FT-Output buffer"

5.3 Example 3: Parameterization of logic diagram



VTable

Function table input buffer	Index 1	Index 2	Index 3	Index 4	Index 5
FT-input buffer **1362**	70 - FI-Release	71 - S2IND	72 - S3IND	73 - S4IND	74 - S5IND

Function table	Index 1	Index 2	Index 3
FT-Instruction **1343**	2 - OR	1 - AND	3 - XOR
FT-input 1 **1344**	2002	2001	2102
FT-input 2 **1345**	2003	2101	2004
FT-input 3 **1346**			2005
FT-input 4 **1347**			
FT-output 1 **1350**			2401
FT-output 1 **1351**			

VPlus

Op. Mode Digital Output 1 **530 =** 80 - output buffer 1

6 Output values and error messages

6.1 Actual values of function table

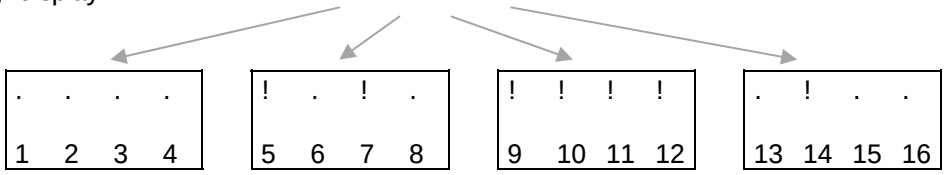
Actual values of input and output buffers

The actual values of the global outputs "2401 - FT-Output buffer 1" to "2416 - FT-Output buffer 16" are displayed by parameter *FT-actual values output buffer* **1357**.

The actual values of the global inputs "2001 - FT-input buffer 1" to "2016 - FT-input buffer 16" are displayed by parameter *FT-actual values input buffer* **1358**.

Example

e.g. display: ".... !.!. !!!! .!.."



"." = logic 0
"!" = logic 1

In example, the following is logic 1:
2405 - FT-Output buffer 5
2407 - FT-Output buffer 7
2409 - FT-Output buffer 9
2410 - FT-Output buffer 10
2411 - FT-Output buffer 11
2412 - FT-Output buffer 12
2414 - FT-Output buffer 14

Actual values of instruction

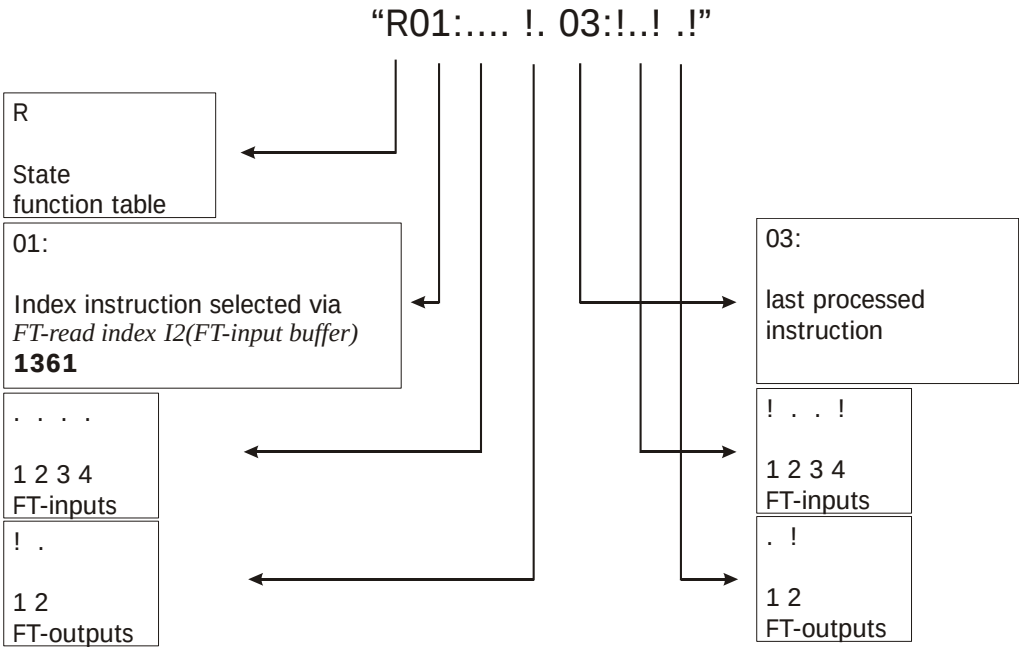
The actual values of an instruction are displayed by parameter *FT-actual values function* **1356**. From left to right, the following is displayed:

- state of function table (e.g. started, stopped)
- index number of selected instruction via *FT-Read index I2 (FT-input buffer)* **1361**
- FT-inputs of selected instruction
- FT-outputs of selected instruction

- index number of last processed instruction
- FT-inputs of last processed instruction
- FT-outputs of last processed instruction

The states of the function table are:
R: Running – function table started
S: Stopped – function table stopped
U: Updating – input and output buffer are being updated
E: Empty – function table is empty
I: Initialization

Example



"." = logic 0
"!" = logic 1

Note: For information on other actual values, refer to the operating instructions of the frequency inverter.

6.2 Digital output signals of function table

Parameters *OP. Mode Digital Output 1* **530** of digital output S1OUTD and *Op. Mode Digital Output 3* **532** o f the relay output link the digital outputs to various functions. The use of the multifunctional output MFO1 as a digital output demands selection of an *Operation mode* **550** and linking via parameter *Digital operation MFO1* **554**.
The following output signals of the function table can be assigned to the digital outputs. For information on other operation modes, refer to the operating instructions of the frequency inverter.

Operation mode 530, 532, 554	Function
0 - Off	Digital output is switched off
80 - FT-Output Buffer 1	Output signal of table logic function. Signal source "2401 - FT-Output buffer 1" is the output signal. This signal source contains the output value of the FT-function output assigned to signal source 2401. The assignment is performed via parameter *FT-target output 1* **1350** or *FT-target output 2* **1351**.
81 - FT-Output Buffer 2	Output signal of table logic function. Signal source "2402 - FT-Output buffer 2" is the output signal. This signal source contains the output value of the FT-function output assigned to signal source 2402. The assignment is performed via parameter *FT-target output 1* **1350** or *FT-target output 2* **1351**.
82 - FT-Output Buffer 3	Output signal of table logic function. Signal source "2403 - FT-Output buffer 3" is the output signal. This signal source contains the output value of the FT-function output assigned to signal source 2403. The assignment is performed via parameter *FT-target output 1* **1350** or *FT-target output 2* **1351**.
83 - FT-Output Buffer 4	Output signal of table logic function. Signal source "2404 - FT-Output buffer 4" is the output signal. This signal source contains the output value of the FT-function output assigned to signal source 2404. The assignment is performed via parameter *FT-target output 1* **1350** or *FT-target output 2* **1351**.
100 to 183	Operation modes inverted (LOW active).

6.3 Logic Signal Sources of function table

Logic signal sources can be assigned to the software functions for further processing. In addition to the signals on the digital control inputs, the following signal sources of the function table are available. For information on other signal sources, refer to the operating instructions of the frequency inverter.

Logic signal	Function
2401 - FT-Output Buffer 1	The instructions of the function table can be linked to other functions via the output buffer. The values are updated when the output buffer is written.
2402 - FT-Output Buffer 2	
2403 - FT-Output Buffer 3	
2404 - FT-Output Buffer 4	
2405 - FT-Output Buffer 5	
2406 - FT-Output Buffer 6	
.	
.	
.	
2415 - FT-Output Buffer 15	
2416 - FT-Output Buffer 16	

7 Operation as state machine

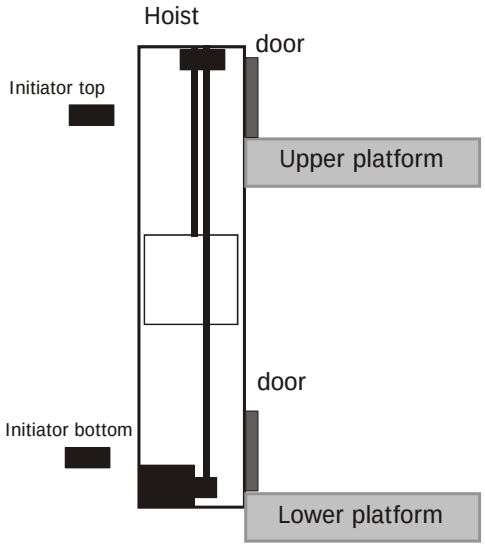
In the previous chapters, the function table was introduced as a sequence of various instructions. In addition, a state machine sequence (also referred to as finite state machine) can be integrated by the specified instruction types. A state machine is often used for representing sequences schematically and for easier implementation of solutions.

In order to realize a state machine sequence, the jump functions are of particular importance. The jump functions are required for changing the state. Inputs 1 and 2 of the jump function are used for checking the condition for the transition. Inputs 3 and 4 set the input buffer and write the output buffer. In the state machine, inputs 3 and 4 are generally set to TRUE at the jump functions for this reason in order to update the changing signals for changing the state.

Example:

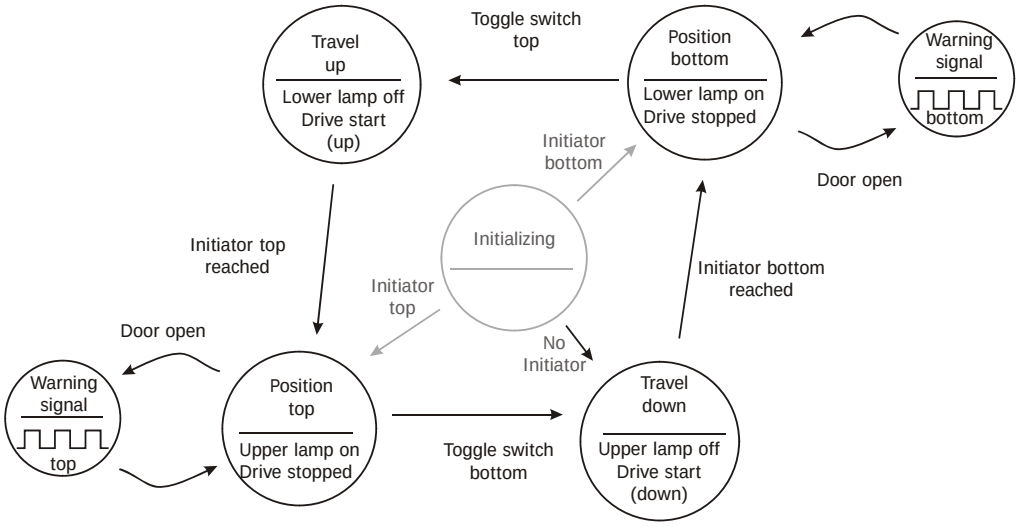
A lifting gear with two positions ("up" and "down") is to be controlled by the function table. The target position is defined via a toggle switch. Each position is equipped with an initiator which informs the frequency inverter that the target has been reached. As soon as the position is reached, the frequency inverter is to stop and the respective LED "top" or "bottom" is to be switched on. As soon as the drive starts again, the LED is turned off.

Both positions are provided with a door which can be opened manually by the user. As soon as one of the two doors is open, the warning lamp "top" or "bottom" is pulsed on and off at an interval of 100 ms. Note that the "door open" signals from the two doors are connected in series.



Representation as state machine step 1

The requirements described above are shown in the following diagram as a state machine. It must be considered that the state must be initialized first when the ACU is switched on (or in the case of a reset). In this example, initialization is performed in order to switch to the correct state. At first, the initiators are evaluated. If one of the initiators signals that the position has been reached, the corresponding state is activated. If no initiator signal is present, the lower position is approached.

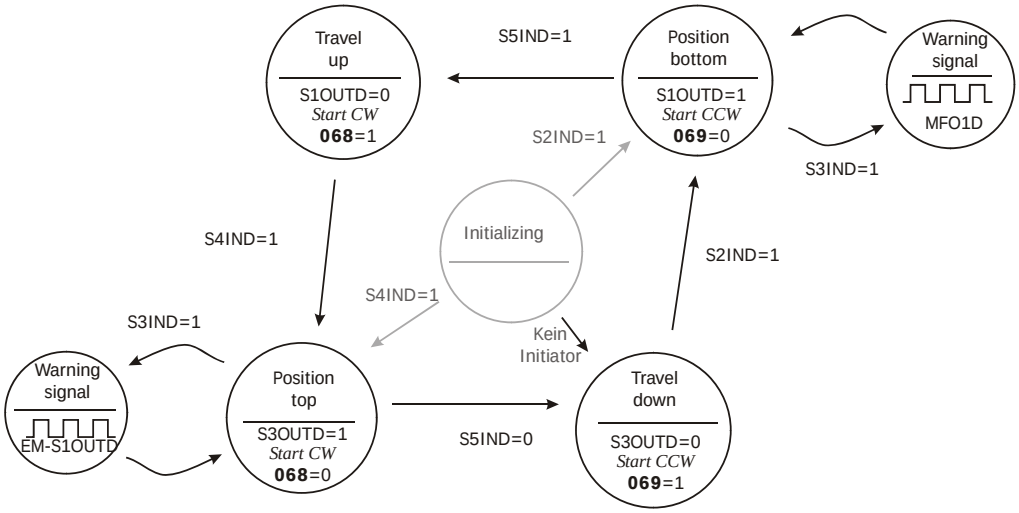


Representation as state machine step 2

Now, the events and actions are assigned to the digital signals of the ACU. At first, the signals are linked to the input and output buffer. An EM-IO-03 extension module is available.

Function	**ACU**	**Input buffer**	**Output buffer**
toggle switch (top/bottom)	S5IND (1/0)	2005	
top position initiator (reached/not reached)	S4IND (1/0)	2004	
bottom position initiator (reached/not reached)	S2IND (1/0)	2002	
door open (open/closed)	S3IND (1/0)	2003	
bottom position lamp (on/off)	S1OUTD (1/0)		2401
top position lamp (on/off)	S3OUTD (1/0)		2402
bottom position door lamp (on/off)	MFO1D (1/0)		2403
top position door lamp (on/off)	EM-S1OUTD (1/0)		2404
start drive (up)	*Start Clockwise* **068**		2410
start drive (down)	*Start Anticlockwise* **069**		2411

With the assignment of the digital ACU signals, the following diagram is obtained:



Solution:
For assignment of the ACU signals and the input buffer of the function table, the following parameterization is required:

2002: FT-input buffer **1362**, Index 2 : "71 – S2IND"
2003: FT-input buffer **1362**, Index 3 : "72 – S3IND"
2004: FT-input buffer **1362**, Index 4 : "73 – S4IND"
2005: FT-input buffer **1362**, Index 5 : "74 – S5IND"
2006: FT-input buffer **1362**, Index 6 : "274 – S5IND inverted" (*)

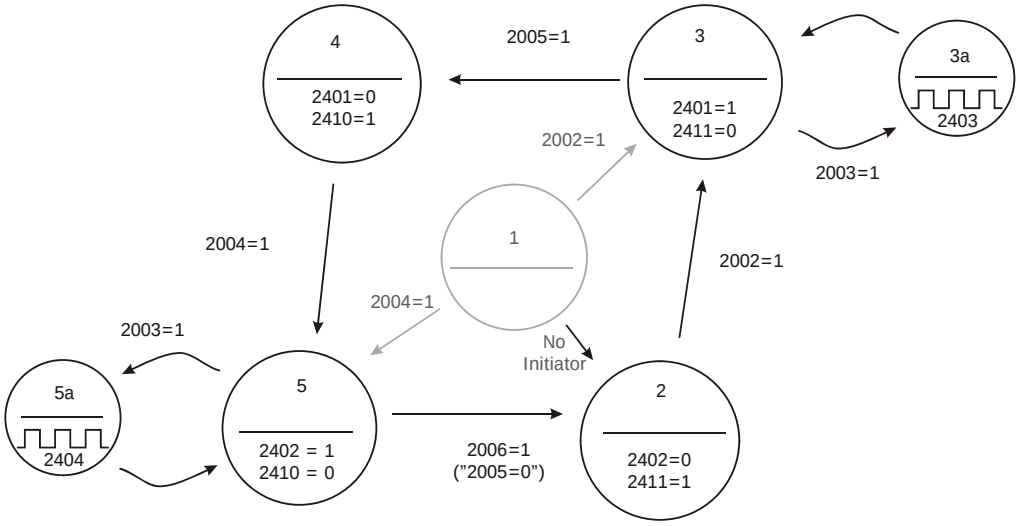
(*): Parameterization deviating from factory settings.

For assignment of the ACU signals and the output buffer of the function table, the following parameterization is required:

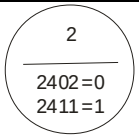
Op. Mode Digital Output 1 **530**	2401 - FT-Output buffer 1
Op. Mode Digital Output 3 **532**	2402 - FT-Output buffer 2
Op. Mode EM-S1OUTD 3 **533**	2404 - FT-Output buffer 4
MFO1: *Operation mode* **550**	1 - Digital output
MFO1: *Digital Operation* **554**	2403 - FT-Output buffer 3
Start Clockwise **068**	2410 - FT-Output buffer 10
Start Anticlockwise **069**	2411 - FT-Output buffer 11

To enable easy checking of the transition "Top Position“ → "Down", the inverted signal of signal S5IND in the input buffer is assigned. For easier parameterization, the names of the states used so far will be replaced by numerical values.

The following diagram is obtained for the signals of the function table:



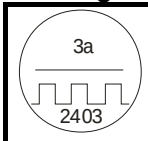
In the first step, the states and transitions are translated into instructions.
Setting state outputs:
To set a digital output (independent of one or several input signals) a boolean operation can be used. An OR-operation is used in this application and an input is set to “TRUE”. By that *FT-target output 1* **1350** is set to “TRUE” (=1) and *FT-target output 2* **1351** is set to “FALSE” (=0).



FT-instruction **1343**	2 – OR
FT-input 1 **1344**	6 – TRUE
FT-input 2 **1345**	7 – FALSE
FT-input 3 **1346**	7 – FALSE
→ *FT-input 4* **1347**	7 – FALSE
FT-parameter 1 **1348**	0
FT-parameter 2 **1349**	0
FT-target output 1 **1350**	2411 FT-Output buffer 11
FT-target output 2 **1351**	2402 FT-Output buffer 2

For states 3 to 5, instructions can be created in the same way.

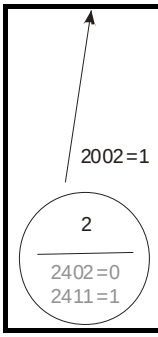
Clock generator (state 3a)



FT-instruction **1343**	80 – Clock generator
FT-input 1 **1344**	2003 – Input Buffer 3
FT-input 2 **1345**	7 – FALSE
FT-input 3 **1346**	7 – FALSE
FT-input 4 **1347**	7 – FALSE
FT-parameter 1 **1348**	100
FT-parameter 2 **1349**	100
FT-target output 1 **1350**	0
FT-target output 2 **1351**	0

The clock generator of state 5a is created in the same way as 3a.

Transition from state 2 to state 3

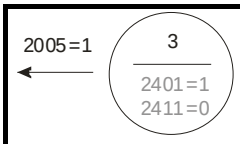


FT-instruction **1343**	100 – Jump function
FT-input 1 **1344**	6 – TRUE
FT-input 2 **1345**	2002 - Input Buffer 2
FT-input 3 **1346**	6 – TRUE
FT-input 4 **1347**	6 – TRUE
FT-parameter 1 **1348**	Index number$_{\text{Next state}}$
FT-parameter 2 **1349**	Index number$_{\text{Own state}}$
FT-target output 1 **1350**	0
FT-target output 2 **1351**	0

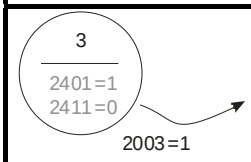
Items "Next state" and "Own state" are used as placeholders until the correct numbers of the indices can be entered. The transition from state 4 to state 5 can be performed in the same way

Transition from state 3 to state 4

The transition from state 3 to state 4 requires a different method, as two jump events have to be checked.



FT-instruction **1343**	100 – Jump function
FT-input 1 **1344**	2005 - Input Buffer 5
FT-input 2 **1345**	6 – TRUE
FT-input 3 1346	6 – TRUE
FT-input 4 **1347**	6 – TRUE
FT-parameter 1 **1348**	next state
FT-parameter 2 **1349**	No jump, next step
FT-target output 1 **1350**	0
FT-target output 2 **1351**	0

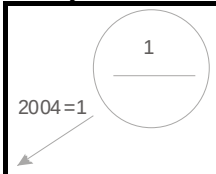
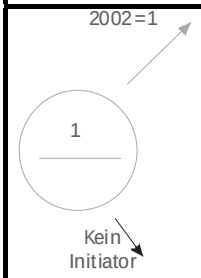


FT-instruction **1343**	100 – Jump function
FT-input 1 **1344**	6 – TRUE
FT-input 2 **1345**	2003 - Input Buffer 3
FT-input 3 **1346**	6 – TRUE
FT-input 4 **1347**	6 – TRUE
FT-parameter 1 **1348**	Jump target, clock generator
FT-parameter 2 **1349**	Jump evaluation, own state
FT-target output 1 **1350**	0
FT-target output 2 **1351**	0

Items "Next state" and "Jump target, clock generator", "Jump evaluation, own state" are used as placeholders until the correct numbers of the indices can be entered. Item "No jump, next step" is a placeholder for any value. The jump function is active only if "2005 – Input buffer 2005" = "1" is fulfilled (DI5=0). Otherwise, the next step will be executed. The transition from state 5 to state 2 can be performed again in the same way.

Initialization

Initialization is a jump function with three targets. For this reason, 2 jump functions are required. The initialization must start with index 1 because the function table always starts at index 1 after a restart.

	*FT-instruction* **1343**	100 – Jump function
	FT-input 1 **1344**	2004 - Input Buffer 4
	FT-input 2 **1345**	6 – TRUE
	FT-input 3 **1346**	6 – TRUE
→	*FT-input 4* **1347**	6 – TRUE
	FT-parameter 1 **1348**	Jump target state 5
	FT-parameter 2 **1349**	No jump, next step
	FT-target output 1 **1350**	0
	FT-target output 2 **1351**	0
	*FT-instruction* **1343**	100 – Jump function
	FT-input 1 **1344**	6 – TRUE
	FT-input 2 **1345**	2002 - Input Buffer 2
	FT-input 3 **1346**	6 – TRUE
→	*FT-input 4* **1347**	6 – TRUE
	FT-parameter 1 **1348**	Jump target state 3
	FT-parameter 2 **1349**	Jump target state 2
	FT-target output 1 **1350**	0
	FT-target output 2 **1351**	0

Now, all blocks are defined. These blocks are entered in the table, the placeholders are replaced by indices. The states are marked in different colors. Non-relevant items are hidden.

	Index 1	Index 2
FT-instruction **1343**	100 – Jump function	100 – Jump function
FT-input 1 **1344**	2004 - Input Buffer 4	6 – TRUE
FT-input 2 **1345**	6 – TRUE	2002 - Input Buffer 2
FT-input 3 **1346**	6 – TRUE	6 – TRUE
FT-input 4 **1347**	6 – TRUE	6 – TRUE
FT-parameter 1 **1348**	11	5
FT-parameter 2 **1349**	2	3
FT-target output 1 **1350**	0	0
FT-target output 2 **1351**	0	0
FT-Commentary **1352**	Init 1	Init 2

	Index 3	Index 4
FT-instruction **1343**	2 – OR	100 – Jump function
FT-input 1 **1344**	6 – TRUE	6 – TRUE
FT-input 2 **1345**	7 – FALSE	2002 - Input Buffer 2
FT-input 3 **1346**	7 – FALSE	6 – TRUE
FT-input 4 **1347**	7 – FALSE	6 – TRUE
FT-parameter 1 **1348**	0	5
FT-parameter 2 **1349**	0	4
FT-target output 1 **1350**	2411 FT-Output buffer 11	0
FT-target output 2 **1351**	2402 FT-Output buffer 2	0
FT-commentary **1352**	Z2: 2411=1	Z2 --> Z3

	Index 5	Index 6
FT-instruction **1343**	2 – OR	80 – Clock generator
FT-input 1 **1344**	6 – TRUE	2003 - Input Buffer 3
FT-input 2 **1345**	7 – FALSE	7 – FALSE
FT-input 3 **1346**	7 – FALSE	7 – FALSE
FT-input 4 **1347**	7 – FALSE	7 – FALSE
FT-parameter 1 **1348**	0	100
FT-parameter 2 **1349**	0	100
FT-target output 1 **1350**	2401 FT-Output buffer 1	2403 FT-Output buffer 3
FT-target output 2 **1351**	2411 FT-Output buffer 11	0
FT-commentary **1352**	Z3: 2401=1	Z3a: clock

	Index 7	Index 8
FT-instruction **1343**	100 – Jump function	100 – Jump function
FT-input 1 **1344**	2005 - Input Buffer 5	6 – TRUE
FT-input 2 **1345**	6 – TRUE	2003 - Input Buffer 3
FT-input 3 **1346**	6 – TRUE	6 – TRUE
FT-input 4 **1347**	6 – TRUE	6 – TRUE
FT-parameter 1 **1348**	9	6
FT-parameter 2 **1349**	8	7
FT-target output 1 **1350**	0	0
FT-target output 2 **1351**	0	0
FT-commentary **1352**	Z3 --> Z4	Z3 -> Z4

	Index 9	Index 10
FT-instruction **1343**	2 – OR	100 – Jump function
FT-input 1 **1344**	6 – TRUE	6 – TRUE
FT-input 2 **1345**	7 – FALSE	2002 - Input Buffer 2
FT-input 3 **1346**	7 – FALSE	6 – TRUE
FT-input 4 **1347**	7 – FALSE	6 – TRUE
FT-parameter 1 **1348**	0	11
FT-parameter 2 **1349**	0	10
FT-target output 1 **1350**	2410 FT-Output buffer 10	0
FT-target output 2 **1351**	2401 FT-Output buffer 1	0
FT-commentary **1352**	Z4: 2410=1	Z4 --> Z5

	Index 11	Index 12
FT-instruction **1343**	2 – OR	80 – Clock generator
FT-input 1 **1344**	6 – TRUE	2003 - Input Buffer 3
FT-input 2 **1345**	7 – FALSE	7 – FALSE
FT-input 3 **1346**	7 – FALSE	7 – FALSE
FT-input 4 **1347**	7 – FALSE	7 – FALSE
FT-parameter 1 **1348**	0	100
FT-parameter 2 **1349**	0	100
FT-target output 1 **1350**	2401 FT-Output buffer 1	2404 FT-Output buffer 4
FT-target output 2 **1351**	2411 FT-Output buffer 11	0
FT-commentary **1352**	Z5: 2401=1	Z5a: clock

	Index 13	Index 14
FT-instruction **1343**	100 – Jump function	100 – Jump function
FT-input 1 **1344**	2006 - Input Buffer 6	6 – TRUE
FT-input 2 **1345**	6 – TRUE	2003 - Input Buffer 3
FT-input 3 **1346**	6 – TRUE	6 – TRUE
FT-input 4 **1347**	6 – TRUE	6 – TRUE
FT-parameter 1 **1348**	3	12
FT-parameter 2 **1349**	14	13
FT-target output 1 **1350**	0	0
FT-target output 2 **1351**	0	0
FT-commentary **1352**	Z5 --> Z2	Z5 -> Z2

8 Parameter List

The parameter list is structured according to the menu branches of the control unit. The parameters are listed in ascending numerical order. A headline (shaded) can appear several times, i.e. a subject area may be listed at different places in the table. For better clarity, the parameters have been marked with pictograms:

The parameter is available in the four data sets.

☑ The parameter value is set by the SETUP routine.

⊗ This parameter cannot be written when the frequency inverter is in operation.

This parameter can only be written in the setting *FT-RunMode* **1399** = "0 – Stop".

I_{FUN}, U_{FUN}, P_{FUN}: rated values of the frequency inverter, ü: overload capacity of frequency inverter

Note: In the KP500 control unit, parameter numbers > 999 are represented in hexadecimal form (999, A00 ... B54 ... C66 ...).

8.1 Actual Value Menu (VAL)

Function table				
1356	FT-actual values function	-	X01:.... .. 01:... ..to X32:!!!! !! 32:!!!! !!	6.1
1357	FT-actual values output buffer	-	.... to !!!! !!!! !!!! !!!!	6.1
1358	FT-actual values input buffer	-	.... to !!!! !!!! !!!! !!!!	6.1

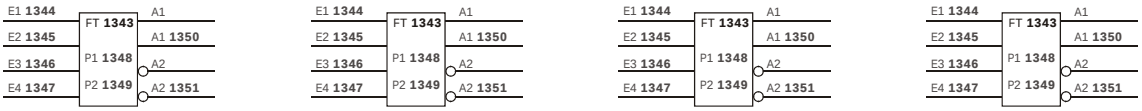
8.2 Parameter Menu (PARA)

	Function table				
	No.	**Description**	**Unit**	**Setting range**	**Chapter**
	1341	FT-write index (FT-table item)	-	1 ... 65	3.1.1
	1342	FT-read index (FT-table item)	-	1 ... 65	3.1.1
	1343	FT-instruction	-	Selection	3.5
	1344	FT-input 1	-	Selection	3.6
	1345	FT-input 2	-	Selection	3.6
	1346	FT-input 3	-	Selection	3.6
	1347	FT-input 4	-	Selection	3.6
	1348	FT-parameter 1	ms/s/min -	time or jump target	3.7
	1349	FT-parameter 2	ms/s/min -	time or jump target	3.7
	1350	FT-target output 1	-	Selection	3.8.1
	1351	FT-target output 2	-	Selection	3.8.1
	1352	FT-commentary	-	16 characters	3.4
	1399	FT-RunMode		Selection	3.3
	Function table input buffer				
	1360	FT-write index I2(FT-input buffer)	-	1 ...33	3.1.2
	1361	FT-read index I2(FT-input buffer)	-	1 ...33	3.1.2
	1362	FT-input buffer		Selection	3.1.2

9 Annex

9.1 Mask: Functions diagram

FT-input buffer **1362**	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	Index 8	Index 9	Index 10	Index 11	Index 12	Index 13	Index 14	Index 15	Index 16
Source:	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Factory setting:	70 - Inverter release	71 - S2IND	72 - S3IND	73 - S4IND	74 - S5IND	75 - S6IND	76 - MFI1D	7 - Off	7 - Off	7 - Off	160 - Standby message	161 - Run message	162 - Error signal	163 - Reference frequency reached	7 - Off	7 - Aus
Changed setting:																



FT-output buffer	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	Index 8	Index 9	Index 10	Index 11	Index 12	Index 13	Index 14	Index 15	Index 16
Source:	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416
Digitaler output:																

9.2 Mask: Functions settings

		1	2	3	4	5	6	7	8
FT-instruction	1343								
FT-input 1	1344								
FT-input 2	1345								
FT-input 3	1346								
FT-input 4	1347								
FT-parameter 1	1348								
FT-parameter 2	1349								
FT-target output 1	1350								
FT-target output 2	1351								
FT-commentary	1352								

		9	10	11	12	13	14	15	16
FT-instruction	1343								
FT-input 1	1344								
FT-input 2	1345								
FT-input 3	1346								
FT-input 4	1347								
FT-parameter 1	1348								
FT-parameter 2	1349								
FT-target output 1	1350								
FT-target output 2	1351								
FT-commentary	1352								

		17	18	19	20	21	22	23	24
FT-instruction	1343								
FT-input 1	1344								
FT-input 2	1345								
FT-input 3	1346								
FT-input 4	1347								
FT-parameter 1	1348								
FT-parameter 2	1349								
FT-target output 1	1350								
FT-target output 2	1351								
FT-commentary	1352								

		25	26	27	28	29	30	31	32
FT-instruction	1343								
FT-input 1	1344								
FT-input 2	1345								
FT-input 3	1346								
FT-input 4	1347								
FT-parameter 1	1348								
FT-parameter 2	1349								
FT-target output 1	1350								
FT-target output 2	1351								
FT-commentary	1352								

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