Nilfisk Foamatic Interface Protocol Specification.

# Introduction

## Purpose and Scope

The purpose is to have an option to remotely control and receive status from Foamatic washing equipment. The protocol is based on TCP socket communication, that is highly platform independent.

This document is addressed to Nilfisk Foamatic customers that want to integrate the Foamatic equipment into other control systems. The Foamatic washing equipment can optionally be controlled remotely from a PLC, PC or other equipment that support Ethernet TCP socket communication.

# Communication definition

The communication has a server and client part. The Foamatic unit is always server and the Foamatic customer's own control system is client.

Therefore the Foamatic unit is passive and waits for the external control system to initiate the connection.

The Foamatic PLC accepts TCP socket connection on port 5000 only.

# 3. Protocol definition

Nilfisk Foamatic Interface Protocol is a TCP/IP based communication on Ethernet.

Commands from client to server has a fixed layout containing 10 bytes of data. The telegram frame consists of a header with start identifier, a telegram number, a command, a parameter and end of transmission.

All data is handled as big-endian.

No CRC is needed, it is handled on TCP/IP protocol level.

Client to server (Commands)

|  |  |  |  |
| --- | --- | --- | --- |
| **Field** | **Byte** | **Data Type** | **Description** |
| Protocol Identifier, Start Transmission | 0..1 | Bytes | Protocol identifier fixed to ASCII characters ‘ST’ (0x53,0x54) |
| Telegram Number | 2..3 | UINT | For transaction pairing. Number is incremented for every  telegram and is returned by receiver in response (optional). |
| Command | 4..5 | UINT | See list of commands below |
| Parameter | 6..7 | UINT | See list of parameters below |
| End Of Transmission | 8..9 | Bytes | Fixed to ASCII characters ‘ET’ (0x45, 0x54) |

Server to client (Response on commands)

Response telegrams has a fixed data length of 3 bytes except watchdog telegrams

|  |  |  |  |
| --- | --- | --- | --- |
| **Field** | **Byte** | **Data Type** | **Description** |
| ACK / NACK | 0 | Bytes | ACK 0x06 is send if command is understood and possible react on, else NACK 0x15 is send |
| Telegram Number | 1..2 | UINT | Same number as received in command from client is returned in the corresponding response telegram |

|  |  |  |  |
| --- | --- | --- | --- |
| **Function** |  |  |  |
| **From External Control to Foamatic** | **Parameter** | **Command** | **Desciption** |
| Open Valve | Valve, bitwise | 101 | Bit 0: Product Valve 1  Bit 1: Product Valve 2  Bit 2: Product Valve 3  Bit 3: Rinse Valve  Bit 4: Product Water Valve  Bit 5: Air Valve |
| Close Valve | Valve, bitwise | 105 | Bit 0: Product Valve 1  Bit 1: Product Valve 2  Bit 2: Product Valve 3  Bit 3: Rinse Valve  Bit 4: Product Water Valve  Bit 5: Air Valve |
| Close All |  | 109 | Close all valves |
| Start Wash Program | Program no 0-15 | 110 | Starts the program which no. matches the parameter |
| Stop Wash Program |  | 111 | Stops the running washing program |
| Pause Wash Program | Program no 0-15 | 112 | Pauses the program which no. matches the parameter |
| Set pressure | 3-15 | 113 | Pressure in bar, integer value. No decimal numbers allowed |
| Clear Errors |  | 114 | Clears all errors in Foamatic. |
| Watchdog |  | 115 | alternating signal, if no change for a period of time, communication error is issued |

Example, Open Rinse Valve:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x01 | 0x00 | 0x65 | 0x00 | 0x08 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x01 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the server, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x01 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Open Product Water Valve:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x02 | 0x00 | 0x65 | 0x00 | 0x10 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x02 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the client, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x02 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Open Air Valve:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x03 | 0x00 | 0x65 | 0x00 | 0x20 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x03 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the client, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x03 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Open Product Valve, product 2:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x04 | 0x00 | 0x65 | 0x00 | 0x02 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x04 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the client, or the parameter(product number) is not valid, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x04 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Close rinse valve:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x05 | 0x00 | 0x69 | 0x00 | 0x08 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x05 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the client, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x05 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Close product water valve:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x06 | 0x00 | 0x69 | 0x00 | 0x10 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x06 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the client, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x06 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Close Air valve:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x07 | 0x00 | 0x69 | 0x00 | 0x20 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x07 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the client, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x07 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Close Product Valve, product 1:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x08 | 0x00 | 0x69 | 0x00 | 0x01 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x08 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the client, or the parameter(product number) is not valid, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x08 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Close all Valves:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x09 | 0x00 | 0x6D | 0x00 | 0x00 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x09 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the client, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x09 | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Start washing program number 11:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x0A | 0x00 | 0x6E | 0x00 | 0x0B | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x0A | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the client, or the parameter(program number) is not valid, or a washing program is already running, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x0A | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, pause the actual running washing program:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x0B | 0x00 | 0x6F | 0x00 | 0x00 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x0B | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is not running on the client, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x0B | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Stop the running washing program:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x0C | 0x00 | 0x70 | 0x00 | 0x00 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x0C | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is not running on the client, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x0C | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Set Pressure = 7 bar:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0xAC | 0x00 | 0x71 | 0x00 | 0x07 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0xAC | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If desired pressure is not within the range 3 - 15 bar a NACK will be sent:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0xAC | Server will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Clear errors:

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x0E | 0x00 | 0x72 | 0x00 | 0x00 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

|  |  |  |  |
| --- | --- | --- | --- |
| 0x06 | 0x00 | 0x0E | Client will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| ACK | Telegram Number | |

If a washing program is running on the client, or the parameter(product number) is not valid, the response will be a negative acknowledge:

|  |  |  |  |
| --- | --- | --- | --- |
| 0x15 | 0x00 | 0x0E | Client will within 1 sec. answer with  Acknowledge or Negative Acknowledge |
| NAK | Telegram Number | |

Example, Watchdog (Keep alive):

The client can send a Watchdog telegram every second seconds. The server will close the connection after 60 seconds with no activity.

Client -> server

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0x53 | 0x54 | 0x00 | 0x0F | 0x00 | 0x73 | 0x00 | 0x00 | 0x45 | 0x54 |
| Start Transmission | | Telegram Number | | Command | | Parameter | | End of transmission | |

Server -> client

This telegram can be a reply on a watchdog(keep alive) telegram or it can be an event telegram sent from the server on a change of interest for the client. It can for example be an error or a washing program that failed or finished.

|  |  |  |
| --- | --- | --- |
| **Byte number** | **Value example** | **Description** |
| 0..1 | 0x5354 | ST' Start Transmission |
| 2..3 | 0x0000 | Telegram number Returns received value or sends 0x0000 if event telegram |
| 4..5 | 0x00D7 | Status, returns 0x00D7(dec. 215) if reply on Watchdog command(dec. 115), else 0x0000 if event telegram |
| 6..9 | 0x00000000 | Error 1 word |
| 10..13 | 0x00000000 | Error 2 word |
| 14..17 | 0x00000000 | Pump error word |
| 18..19 | 0x0001 | Ready for cleaning |
| 20..21 | 0x0001 | Cleaning in progress |
| 22..23 | 0x0005 | Program 5 finished |
| 24..25 | 0x0005 | Program 5 stopped |
| 26..27 | 0x0007 | Program 7 paused |
| 28..29 | 0x0401 | Program 4 failed with  error code 1 |
| 30..31 | 0x4554 | ET' end of transmission |