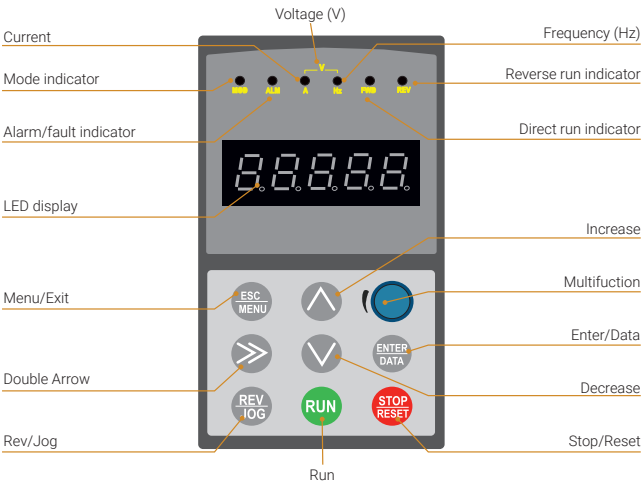


toscano



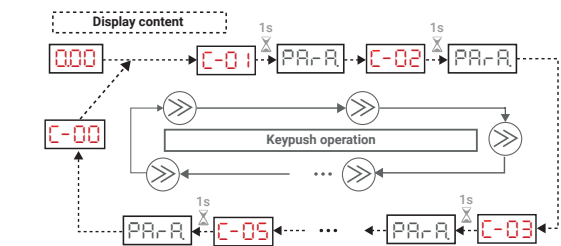
Frequency inverters

Keypad distribution

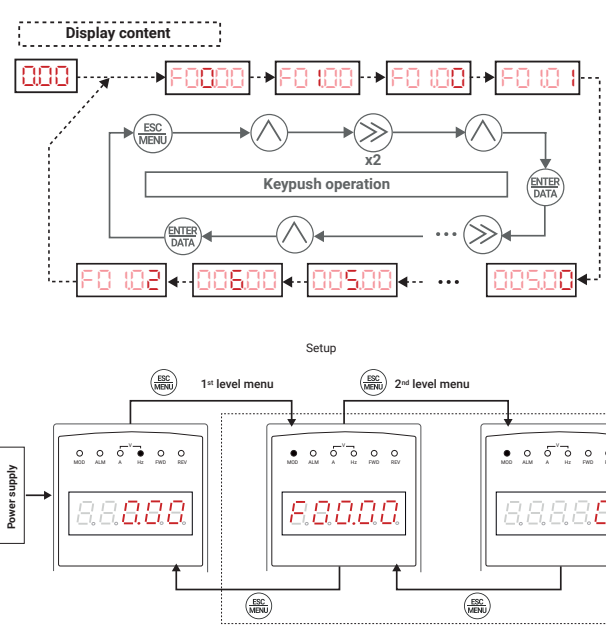


| Key | Name          | Description                                                                                               |
|-----|---------------|-----------------------------------------------------------------------------------------------------------|
|     | Menu          | Enter or exit of the functions menu or cancel the current value                                           |
|     | Double Arrow  | Change visualization parameter or digit to modify                                                         |
|     | Enter/Data    | Enter to the selected function value or confirm the current function value                                |
|     | Rev/Jog       | During visualization mode, reversed run command or jog run command                                        |
|     | Run           | Keypad run command                                                                                        |
|     | Stop/Reset    | Stop command                                                                                              |
|     | Multifunction | Same function as increase and decrease keys. Turn clockwise to increase and counterclockwise to decrease. |
|     | Increase      | Increase the selected digit for the function or value (keep pressed to increase change speed)             |
|     | Decrease      | Decrease the selected digit for the function or value (keep pressed to increase change speed)             |

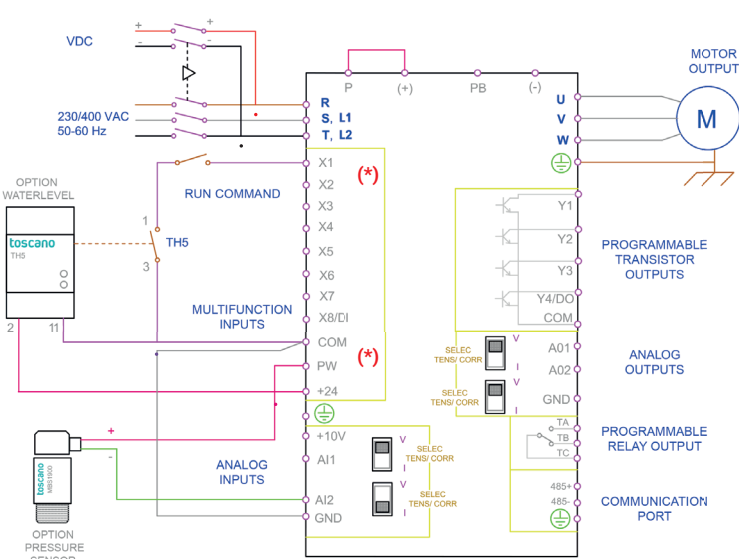
Supervision value display



Function parameter value adjustment



Basic wiring diagram



(\*) F01.15 and F08.18 functions (See "General inverter control" table)

Monitoring

| Code  | Description                                                  | Function             | Default |
|-------|--------------------------------------------------------------|----------------------|---------|
| 0     | Main frequency (0.01Hz)                                      | F00.01 / C-00 / RUN  | 51      |
| 1     | Auxiliar frequency (0.01Hz)                                  | F00.02 / C-01 / RUN  | 2       |
| 2     | Setting frequency (0.01Hz)                                   | F00.03 / C-02 / RUN  | 4       |
| 3     | Output Frequency (0.01Hz)                                    | F00.04 / C-03 / RUN  | 5       |
| 4     | Output current (0.1A)(≤11kW display 0.01A)                   | F00.05 / C-04 / RUN  | 6       |
| 5     | Output voltage (1V)                                          | F00.06 / C-05 / RUN  | 9       |
| 6     | DC bus voltage (0.1V)                                        | F00.07 / C-00 / STOP | 2       |
| 7     | Motor speed (1 rpm)                                          | F00.08 / C-01 / STOP | 6       |
| 8     | Linear motor speed (1 rpm)                                   | F00.09 / C-02 / STOP | 48      |
| 9     | Inverter temperature (1°C)                                   | F00.10 / C-03 / STOP | 14      |
| 10    | Current process running time(0.1min)                         | F00.11 / C-04 / STOP | 20      |
| 11    | Accumulated power on time (1h)                               | F00.12 / C-05 / STOP | 9       |
| 12    | Power on time (1h)                                           |                      |         |
| 13    | Inverter status                                              |                      |         |
| 14    | Input terminals status                                       |                      |         |
| 15    | Output terminals status                                      |                      |         |
| 20    | Analog input AI1 (after process) (0.01V/0.01mA)              |                      |         |
| 21    | Analog input AI2 (after process) (0.01V/0.01mA)              |                      |         |
| 24    | Analog output AO1 (after process) (0.01V/0.01mA)             |                      |         |
| 25    | Analog output AO2 (after process) (0.01V/0.01mA)             |                      |         |
| 28    | Input frequency, frequency input (before process) (1Hz)      |                      |         |
| 30    | PID set value (0.01V)                                        |                      |         |
| 31    | PID feedback signal (0.01V)                                  |                      |         |
| 32    | PID error signal (0.01V)                                     |                      |         |
| 33    | PID output frequency (0.01Hz)                                |                      |         |
| 34    | PLC: current step                                            |                      |         |
| 35    | Selected multispeed                                          |                      |         |
| 36-38 | Reserved                                                     |                      |         |
| 39    | Current length (m/cm/mm)                                     |                      |         |
| 41    | Internal counter: current value                              |                      |         |
| 42    | Internal timer: current value (0.1s)                         |                      |         |
| 43    | Run command channel (0: Keypad 1: Terminal 2: Communication) |                      |         |
| 44    | Main frequency setting channel                               |                      |         |
| 45    | Auxiliar frequency settings channel                          |                      |         |
| 46    | Rated current (0.1A)                                         |                      |         |
| 47    | Rated voltage (1V)                                           |                      |         |
| 48    | Rated power (0.1KW)                                          |                      |         |
| 49    | Electric torque limit (0.1% of rated torque)                 |                      |         |
| 50    | Braking torque limit (0.1% of rated torque)                  |                      |         |
| 51    | Frequency reference (0.01Hz)                                 |                      |         |
| 52    | Rotor speed (0.01Hz)                                         |                      |         |
| 53    | Setting torque (% of rated torque with direction)            |                      |         |
| 54    | Output torque (% of rated torque with direction)             |                      |         |
| 55    | DC bus current (0.1A)                                        |                      |         |
| 56    | Instantaneous flow (0.3 m3/h)                                |                      |         |
| 57    | Open circuit voltage (0.1V)                                  |                      |         |
| 58    | Output power (Active power) (0.1KW)                          |                      |         |
| 59    | Total used energy (low) (1 kwh)                              |                      |         |
| 60    | Total energy used (high) (10000 kwh)                         |                      |         |
| 61    | Reserved                                                     |                      |         |
| 62    | Bus current (0.1A)                                           |                      |         |
| 63    | Instantaneous water flow (0.1m³/h)                           |                      |         |
| 64    | Open circuit voltage (0.1V)                                  |                      |         |
| 65    | Daily generated energy (0.1kwh)                              |                      |         |
| 66    | Daily total transferred water volume (0.1 m³)                |                      |         |
| 67    | Total transferred water volume (low) (1m³)                   |                      |         |
| 68    | Total transferred water volume (high) (10000m³)              |                      |         |

The default values change according to the programmed application. Here indicated is the most common.

| Item                   | Description                                                                                                                         |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Digital display        | Display the current status of the inverter and the status parameters                                                                |
| A, Hz, V               | Unit of the status parameter being displayed (Amps for current, Volts for voltage and Hertz for frequency).                         |
| MOD                    | Menu indicator: indicates that it is inside the functions menu. After 20 second without touching any key, it will exit of the menu. |
| ALM                    | Alarm indicator: indicates that the VFD as detected an Alarm or a Fault and it is stopped or waiting for auto fault reset.          |
| FWD                    | Forward running: indicates that the VFD has direct run command and the motor is turning in direct direction.                        |
| REV                    | Reverse running: indicates that the VFD has reverse run command and the motor is turning in reverse direction.                      |
| Function display       |                                                                                                                                     |
| Status light indicator | If both indicators are light at the same time indicates DC braking.                                                                 |

Fault codes

| Code | Description                                          |
|------|------------------------------------------------------|
| E-1  | Overload during acceleration                         |
| E-2  | Overload during deceleration                         |
| E-3  | Overload at constant speed                           |
| E-4  | Overvoltage during acceleration                      |
| E-5  | Overvoltage during deceleration                      |
| E-6  | Overvoltage at constant speed                        |
| E-7  | Overvoltage while stop                               |
| E-8  | Voltage lost while running                           |
| E-9  | Inverter overload                                    |
| E-10 | Motor overload                                       |
| E-11 | Motor underload                                      |
| E-12 | Input phase lost                                     |
| E-13 | Motor phase lost                                     |
| E-14 | Internal inverted protection                         |
| E-15 | Shortcircuit to ground during running                |
| E-16 | Shortcircuit to ground after power on                |
| E-17 | Inverter overheating                                 |
| E-18 | External fault                                       |
| E-19 | Current detection circuit fault                      |
| E-20 | External interference                                |
| E-21 | Internal interference                                |
| E-22 | PID provision signal lost                            |
| E-23 | PID feedback signal lost                             |
| E-24 | PID abnormal signal value                            |
| E-25 | Running terminal active during power on protection   |
| E-26 | Communication fault                                  |
| E-30 | EEPROM read/write fault                              |
| E-31 | Temperature sensor fault                             |
| E-32 | Motor autotune fault                                 |
| E-33 | Contactor fault                                      |
| E-36 | Capacitors overheating (models with this protection) |
| E-37 | Reserved                                             |
| E-38 | Overspeed protection                                 |
| E-39 | Speed out of allowed range protection                |
| E-40 | Reserved                                             |
| E-41 | Analog input disconnection detection                 |
| E-42 | Solar low frequency protection                       |
| A-42 | Solar underload protection                           |
| E-43 | Solar underload protection                           |
| A-43 | Solar underload protection                           |
| E-44 | Solar overload protection                            |
| A-44 | Solar overload protection                            |
| E-45 | Solar minimum generated power protection             |
| A-45 | Solar minimum generated power protection             |
| A-46 | Asymmetric timer                                     |
| A-47 | Solar low voltage protection                         |
| A-51 | Incorrect parameters selection (F01.00 ≠ F01.03)     |
| A-52 | Incorrect parameter selection                        |
| A-53 | Maximum alarms limit reached                         |

Lock !

Keypad Lock:  
Press ENTER key during 4 seconds.

Keypad Unlock:  
Press ESC key during 4 seconds.

Basic motor values

| Function | Description           | Units | Details          |
|----------|-----------------------|-------|------------------|
| F15.01   | Rated motor power     | kW    | Depends on motor |
| F15.02   | Rated motor voltage   | V     | Depends on motor |
| F15.03   | Rated motor current   | A     | Depends on motor |
| F15.04   | Rated motor frequency | Hz    | Depends on motor |
| F15.05   | Rated motor speed     | r/min | Depends on motor |
| F15.06   | Motor pairs of poles  | 1...7 | Depends on motor |

Motor Tuning

The Motor Tuning function measure some motor parameters that allows the inverter to get a better vectorial control and energy saving running. Set the function F15.19 value according to the installation and the values of the table below.

| Function | Description                     | Details                                                                                                                   |
|----------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| F15.19   | Motor Tuning function selection | 1= Load can not be disconnected from the motor axe<br>2= Load can be disconnected from motor axe and it can rotate freely |

General inverter control

| Function | Description                       | Value | Details                                     |
|----------|-----------------------------------|-------|---------------------------------------------|
| F01.04   | Keypad maximum frequency          | 50.00 | Hz                                          |
| F01.11   | Maximum frequency                 | 50.00 | Hz                                          |
| F01.12   | Minimum frequency                 | 00.00 | Hz (for solar applications)                 |
|          |                                   | 30.00 | Hz (for industrial applications)            |
| F01.15   | Run command selection             | 1     | Input terminal (see "Basic Wiring Diagram") |
| F08.18   | X1 input terminal function        | 1     | Start forward (See "Basic Wiring Diagram")  |
| F19.13   | Overvoltage on deceleration value | 140   | %                                           |
|          |                                   | 0     | High overload (Motors)                      |
| F00.23   | Overload mode                     | 1     | Low overload (Pumps & fans)                 |

Restore

| Function | Description                 | Value | Details                                                                            |
|----------|-----------------------------|-------|------------------------------------------------------------------------------------|
| F00.14   | Parameters function control | 010   | All functions back to factory default (not included the fault functions group F26) |

Contant pressure application (PID)

Need pressure sensor (MBS1900)

| AC power supply |                                      |                   |                                          |
|-----------------|--------------------------------------|-------------------|------------------------------------------|
| Function        | Description                          | Value             | Details                                  |
| F12.15          | Solar mode selection                 | 0                 | Disabled                                 |
| F00.20          | Analog input setup selection         | 0010              | AI2 Analog                               |
| F01.00          | Main frequency selection channel     | 00                | Keypad                                   |
| F01.03          | Auxiliar frequency selection channel | 20                | Reserved                                 |
| F11.00          | PID mode                             | 1                 | Enabled                                  |
| F11.01          | PID setup value channel selection    | 0                 | Setup value                              |
| F11.02          | PID feedback selection channel       | 1                 | Analog input AI2                         |
| F11.13          | Output signal polarity               | 0                 | Positive                                 |
| F11.16          | PID minimum frequency                | 30.00             | Hz                                       |
| F12.00          | Water supply selection mode          | 1                 | Enabled                                  |
| F12.06          | Pressure sensor range                | Pressure          | (example 10 bar)<br>(9.999 for 0-10 bar) |
| F12.01          | PID setup value                      | Target pressure   | (example 4.000bar)<br>(>F12.03)          |
| F12.02          | PID sleep frequency                  | Sleep frequency   | (recommended 37Hz)                       |
| F12.03          | PID wake up frequency                | Wake up frequency | (example 3.000 bar)<br>(<F12.01)         |
| F12.04          | PID sleep delay time                 | 10.0              | Seconds                                  |

Special applications: Solar MPPT

| Frequency regulation according to the power generated by the photovoltaic panels.<br>MPPT mode (Recommended) |                                  |                |                           |
|--------------------------------------------------------------------------------------------------------------|----------------------------------|----------------|---------------------------|
| Function                                                                                                     | Description                      | Value          | Details                   |
| F12.15                                                                                                       | Solar mode selection             | 1              | MPPT                      |
| F12.28                                                                                                       | Wake up DC voltage               | Activation VDC | TDS600-2S=220V            |
|                                                                                                              |                                  |                | TDS600-4T=440V            |
| F12.26                                                                                                       | Sleep DC voltage                 | Stop VDC       | TDS600-2S=200V            |
|                                                                                                              |                                  |                | TDS600-4T=400V            |
| F12.29                                                                                                       | Wake up delay time               | 300            | Seconds                   |
| F12.30                                                                                                       | Solar mode minimum frequency     | Frequency      | Depending on installation |
| F12.31                                                                                                       | Minimum frequency detection time | 10             | Seconds                   |
| F12.32                                                                                                       | Minimum frequency recovery time  | 300            | Seconds                   |
| F12.36                                                                                                       | Overload current                 | Current        | Depending on pump         |
| F12.37                                                                                                       | Overload detection time          | 10             | Seconds                   |
| F12.38                                                                                                       | Overload recovery time           | 300            | Seconds                   |
| F12.24                                                                                                       | Solar mode protection stop mask  | 1F             | Deceleration              |

Special applications: Solar MPPT+PID

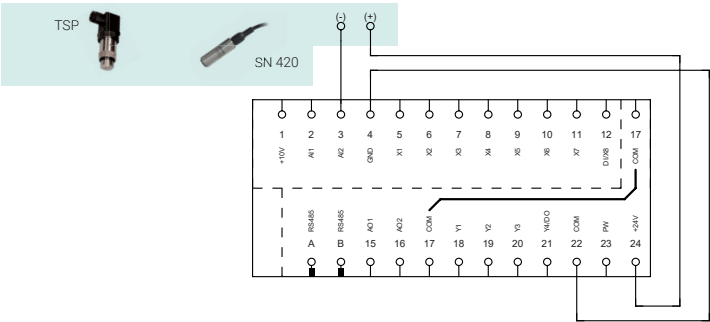
| Function | Description                          | Value             | Details                                  |
|----------|--------------------------------------|-------------------|------------------------------------------|
| F12.15   | Solar mode selection                 | 4                 | MPPT+PID                                 |
| F12.26   | Sleep DC voltage                     |                   | TDS600-2S = 200V,<br>TDS600-4T=400V      |
| F12.28   | Wake up DC voltage                   |                   | TDS600-2S = 220V,<br>TDS600-4T=440V      |
| F12.29   | Wake up delay time                   | 300               | Seconds                                  |
| F00.20   | Analog input setup selection         | 0010              | AI2 Analog                               |
| F01.00   | Main frequency selection channel     | 00                | Keypad                                   |
| F01.03   | Auxiliar frequency selection channel | 20                | Reserved                                 |
| F11.00   | PID mode                             | 1                 | Enabled                                  |
| F11.01   | PID setup value channel selection    | 0                 | Setup value                              |
| F11.02   | PID feedback selection channel       | 1                 | Analog input AI2                         |
| F11.13   | Output signal polarity               | 0                 | Positive                                 |
| F11.16   | PID minimum frequency                | 30.00             | Hz                                       |
| F12.00   | Water supply selection mode          | 1                 | Enabled                                  |
| F12.06   | Pressure sensor range                | Pressure          | (example 10 bar)<br>(9.999 for 0-10 bar) |
| F12.01   | PID setup value                      | Target pressure   | (example 4.000bar) (>F12.03)             |
| F12.02   | PID sleep frequency                  | Sleep frequency   | (recommended 37Hz)                       |
| F12.03   | PID wake up frequency                | Wake up frequency | (example 3.000 bar) (<F12.01)            |
| F12.04   | PID sleep delay time                 | 10.0              | Seconds                                  |

Constant water level in wells or deposits application using PID

Continuous level sensor required (SN420)

| Function                                                                                       | Description                | Value            | Details                                    |
|------------------------------------------------------------------------------------------------|----------------------------|------------------|--------------------------------------------|
| <i>*Configuration: copy from the Constant Pressure Application</i>                             |                            |                  |                                            |
| F11.14                                                                                         | PID output signal polarity | 1                | Negative                                   |
| <i>*Consider the setup value and the wake up value, as the empty value of the water column</i> |                            |                  |                                            |
| F12.01                                                                                         | PID setup value            | Setup value      | (example 8m) = sensor range - water column |
| F12.03                                                                                         | PID wake up value          | Wake up pressure | (example 2m) = sensor range-water column   |

Note: The values here shown are only for orientative purposes and must be adjusted depending on the installation setup

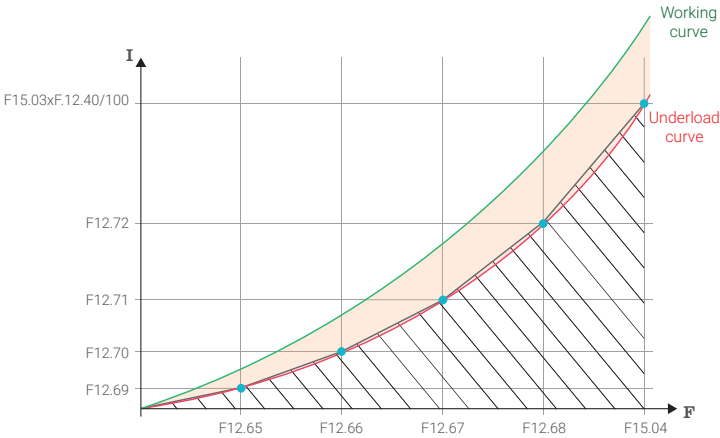


Broken pipe function

| Function | Description     | Value     | Details                   |
|----------|-----------------|-----------|---------------------------|
| F19.27   | Target pressure | 0-100     | % of the transducer range |
| F19.28   | Detection time  | 0.0-500.0 | seconds                   |
| F19.31   | Activation      | 030       | Fault, free stop          |

Solar, Solar+PID underload protection

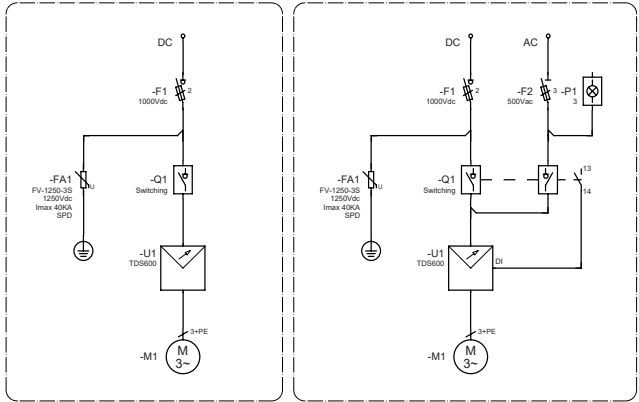
| Function | Description                                 |
|----------|---------------------------------------------|
| F12.40   | Detection time for the underload protection |
| F12.41   | Waiting time for the underload protection   |
| F12.42   | Underload recovery time                     |
| F12.65   | Underload curve protection, frequency 0     |
| F12.66   | Underload curve protection, frequency 1     |
| F12.67   | Underload curve protection, frequency 2     |
| F12.68   | Underload curve protection, frequency 3     |
| F12.69   | Underload curve protection, current 0       |
| F12.70   | Underload curve protection, current 1       |
| F12.71   | Underload curve protection, current 2       |
| F12.72   | Underload curve protection, current 3       |



Solar pump specifications

| Type                             | 4T serie                | 2S serie      |
|----------------------------------|-------------------------|---------------|
| Maximum DC voltage (**)          | 800V DC                 | 400V DC       |
| MPPT&CVT allowable voltage range | 350V~750V DC            | 160V~380VDC   |
| Rated input voltage              | 530VDC/380VAC           | 310VDC/220VAC |
| Rated output voltage             | 3PH 380V AC             | 3PH 220V AC   |
| MPPT efficiency                  | >97%                    |               |
| Frequency output range           | 0~600Hz                 |               |
| Maximum efficiency               | >97%                    |               |
| Protection level                 | IP20 Forced air cooling |               |

**Inverter and PV panels selection recommendation.**  
The PV panels total installed power must be 1,3 times the rated power of the inverter.

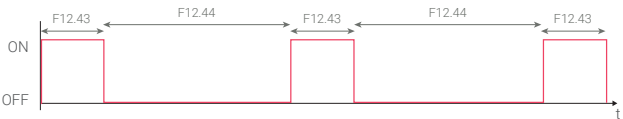


Multipump

| Function | Description             | Value | Details                |
|----------|-------------------------|-------|------------------------|
| F09.00   | Y1 output configuration | 37    | 1° motor controlled    |
| F09.01   | Y2 output configuration | 38    | 1° motor direct supply |
| F09.02   | Y3 output configuration | 39    | 2° motor controlled    |
| F09.03   | Y4 output configuration | 40    | 2° motor direct supply |

Asymetric timer

| Function | Description                   | Details |
|----------|-------------------------------|---------|
| F12.43   | Asymetric timer, running time | seconds |
| F12.44   | Asymetric timer, waiting time | seconds |



Filling pipe function

| Function | Description                     | Value | Details           |
|----------|---------------------------------|-------|-------------------|
| F11.19   | Filling pipe function frequency | 30    | Frequency (Hz)    |
| F12.44   | Filling pipe function timeout   | 60    | timeout (seconds) |

Parameters copy

| Function | Description     | Value | Details           |
|----------|-----------------|-------|-------------------|
| F00.27   | Parameters copy | 10    | Inverter → Keypad |
| F00.27   | Parameters copy | 20    | Keypad → Inverter |