CONFIGURATION AND DIAGNOSTICS
FOR UNIFREM VF FREQUENCY CONVERTERS

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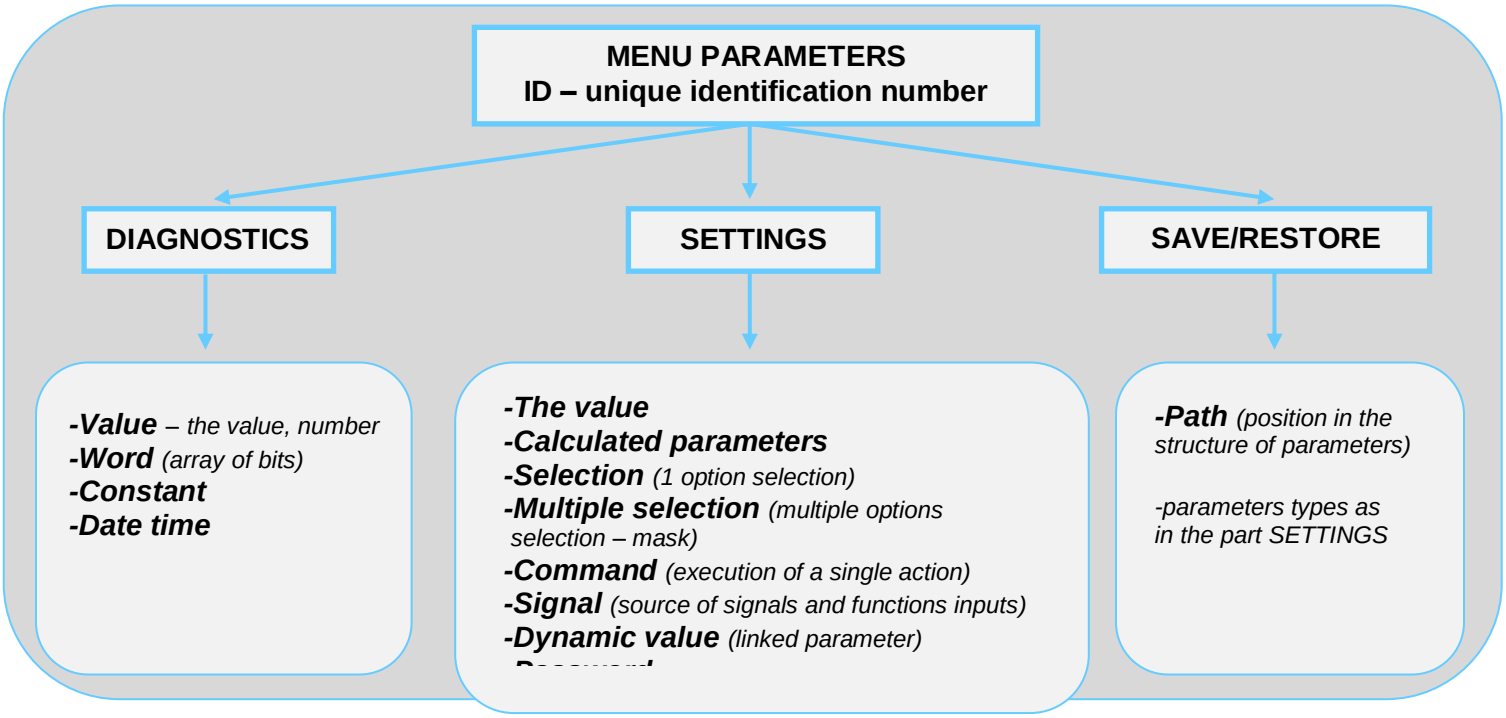
1 Contents

WARNING

This manual dedicates to the parameters and options of VONSCH UNIFREM VF frequency converter settings and diagnostics.

2 STRUCTURE AND TYPES OF PARAMETERS IN THE DOCUMENT



2.1 Defining the meaning and type of parameters in part MENU - DIAGNOSTICS:

Parameter type: VALUE - Diagnostic parameter that displays the value of signal in physical units or in relative units or discrete number of sequences, steps, received data etc.

Position of the parameter in a tree hierarchical parameters structure

*MENU \ DIAGNOSTICS \ Inputs / outputs \ AIN *

Name [ID]	Unit	Description
AIN1 Rel. [41]	%	Value of the signal connected to the analog input terminals + X1:11 and - X1:12.Parameters of the analog input can be configured in the parameter group P[147] (pg.:**Chyba! Záložka nie je definovaná.**) AIN1.

Values ID and name

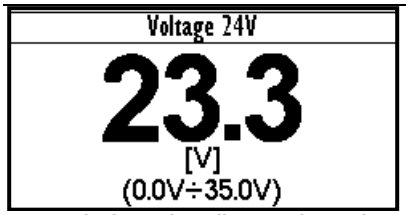
Value unit

The basic diagnostics information about the importance of value

EXAMPLES OF THE PARAMETER, VALUE TYPE:

VALUE – THE VALUE
*MENU \ DIAGNOSTICS \ Converter state *

VALUE – DISCRETE NUMBER
MENU \ DIAGNOSTICS \ Functions \ Lifting functions



Example for value diagnostics – the value display

Example of diagnostic value representing the number of illegal control drive sequences

Parameter type: WORD - Individual word bits status diagnostics. Each bit represents the status of one flag of a specific function or converter mode.

The basic diagnostic information about the importance of word

MENU \ DIAGNOSTICS \ Functions \ Lifting functions

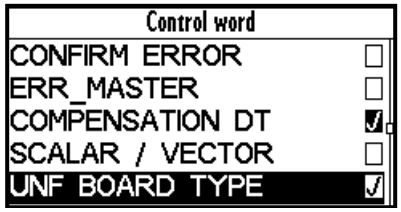
Name [ID]	Unit	Description
OPS status [856]		Indicates the status of the OPS switch block.
Reset	RESET signal of the OPS is active.	
Detection	Autodetection of the overload limits is running.	
Overload	Overload occurred. Operation in the positive direction (up) is blocked.	
Tipping	Too many forbidden tipping control commands.	
Settling	Drive operates in static mode.	
Dynamics	Drive operates in dynamic mode.	

Individual word bits description

Additional diagnostic information about word bits view, status of word bits view, respectively meaning of word bits

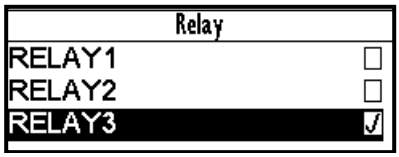
EXAMPLES OF THE PARAMETER, WORD TYPE:

*MENU \ DIAGNOSTICS \ Command *



Converter control signals diagnostics

*MENU \ DIAGNOSTICS \ Inputs / outputs *



Output relays status diagnostics

Parameter type: CONSTANT - Diagnostic information, which takes a fixed value.

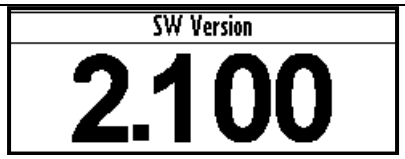
*MENU \ DIAGNOSTICS \ SW and HW version *

Name [ID]	Unit	Description
SW Version [379]		Converter SW version

Name [ID]	Unit	Description
Serial number [35]	First part of the converter unique serial number.	

Constant description

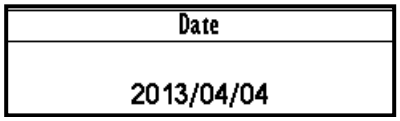
EXAMPLE OF THE PARAMETER, CONSTANT TYPE:



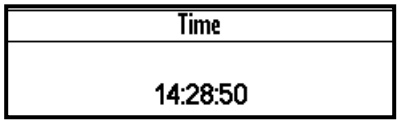
Constant

Parameter type: DATE TIME – Diagnostic value of the date or time format.

*MENU \ DIAGNOSTICS *



*MENU \ DIAGNOSTICS *



2.2 Defining the meaning and type of parameters in part MENU - SETTINGS:

Parameter type: THE VALUE - Possibility of parameter value setting in absolute, or relative units.

Basic information about the importance of the parameter

MENU \ SETTINGS \ MOTOR \

Name [ID]	Description	Def.
Nom. Current [151]	Nominal motor current, read from the nameplate or catalog data.	2.80 A
0.01 A ÷ 1000.00 A	This parameter determines the value of permanent motor current for motor overload protection P[27] (pg.:**Chyba! Záložka nie je definovaná.**) Motor overloading.	

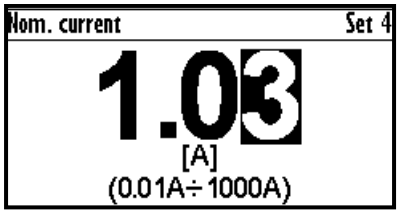
Range of the value, that parameter can take Min ÷ Max

Additional information about the importance of the parameter

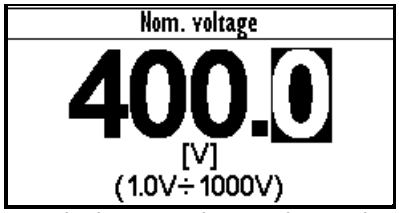
The default value of the parameter – The value that is set at factory settings restoration

EXAMPLES OF THE PARAMETER, THE VALUE TYPE:

*MENU \ SETTINGS \ MOTOR *



Motor current value setting



Nominal motor voltage value setting

Parameter type: CALCULATED PARAMETER - Parameter, that is derived by calculation based on the values of other parameters.

*MENU \ SETTINGS \ MOTOR \ SPECIAL PARAMETERS *

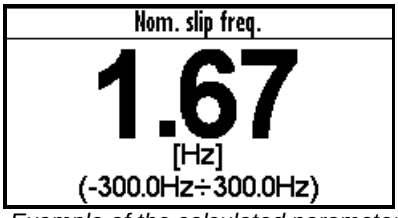
Name [ID]	Description	Def.

Nr of motor poles [1049]	Number of motor poles calculated from the nominal rpms and the motor frequency.
2 ÷ 1000	

Additional information about derivation of parameter calculation.

EXAMPLE OF THE PARAMETER, CALCULATED PARAMETER TYPE:

*MENU \ SETTINGS \ MOTOR \ SPECIAL PARAMETERS *



Example of the calculated parameter

Parameter type: SELECTION - Type of parameter with option to select only one setting option (alternative).

Basic information about type of parameter - selection

*MENU \ SETTINGS \ COMMANDS \ START STOP RESET *

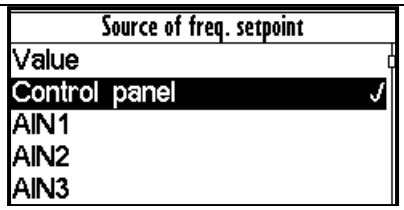
Name [ID]	Description	Def.
Start source [194]	Setting the converter start source. The START command generates the desired voltage and frequency on the U,V,W outputs (or U,V for a single phase load).	BIN1
Control panel	Pressing the green START button on the control panel causes the converter to start. The start is canceled by pressing the red STOP button.	
Permanent start	The converter starts immediately after the switch on.	
BIN1	The converter start after the activation of the 1st binary input.	
BIN5	The converter starts after the activation of the 5th binary input.	
BIN6	The converter starts after the activation of the 6th binary input.	
MODBUS	The converter start is controlled over the serial communication. See the MODBUS serial communication protocol.	
PROFIBUS	The converter start is controlled over the serial communication. See the PROFIBUS serial communication protocol.	
Special	The converter start is controlled by a special preset signal and switching thresholds, see P[987] (pg.:**Chyba! Záložka nie je definovaná.**) SPECIAL START.	

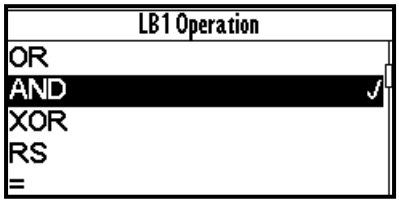
The name of specific (alternative) selection of parameter value

Additional information about the meaning of a specific parameter selection

EXAMPLES OF THE PARAMETER, SELECTION TYPE:

*MENU \ SETTINGS \ COMMANDS \ FREQUENCY SETPOINT \ MENU \ SETTINGS \ FUNCTIONS \ LOGICAL BLOCKS\ LB1 (Fast) *





One setting option selection of selection type parameter examples

Parameter type: MULTIPLE SELECTION (MASK) - Parameter type with a option to select multiple possible value elections, modes, respectively active bit of parameter.

Basic information about the parameter type - multiple selection

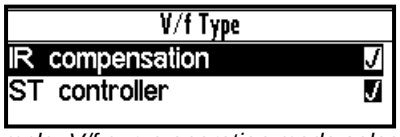
MENU \ SETTINGS \ CONTROL AND REGULATION \ V/f CONTROL \ V/f CURVE \

Name [ID]	Description	Def.
V/f Type [347]	V/f Curve type. Selecting the features of the V/f control method operation.	
□ IR compensation	Turns on the stator resistance loss compensation P[973] (pg.:**Chyba! Záložka nie je definovaná.**) Compensation of IR (CIR). Requires correct value of the motor parameters and the stator resistance P[345] (pg.:**Chyba! Záložka nie je definovaná.**) Stator resistance.	
□ ST controller	Turns on the starting torque controller P[29] (pg.:**Chyba! Záložka nie je definovaná.**) ST Controller (STC) to boost starting torque.	

Names of parameter value elections (modes)

Additional information about the meaning of individual parameter elections (modes)

EXAMPLE OF THE PARAMETER, MULTIPLE SEL METER, MULTIPLE SEL



Example: V/f curve operation mode selection

Parameter type: COMMAND - Command to execute a single action or operation on the converter. It is required to confirm the command before execution in the confirmation window.

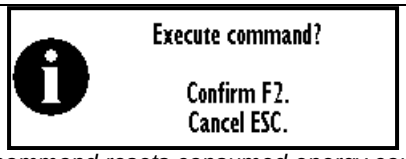
*MENU \ SETTINGS \ CONVERTER PARAMETERS \ Energy consumption *

Name [ID]	Description	Def.
Reset the consumption [897]	This command resets the counters of consumed energy.	

Name and command ID

Funcion, description and importance of the command

EXAMPLE OF THE PARAMETER, COMMAND TYPE:



This command resets consumed energy counters

Parameter type: SIGNAL - Parameter for dynamic ties and any parameter connection, that becomes a value source for a given function or for input of this function.

*MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN1 \ SPECIAL SETTING *

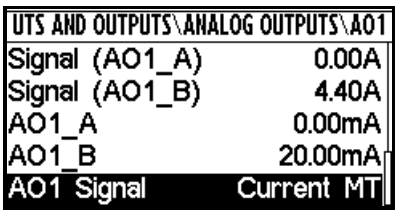
Name [ID]	Description	Def.
AIN1 Signal [251]	Selection of the signal that will be linearly recalculated according to the analog input.	[-]

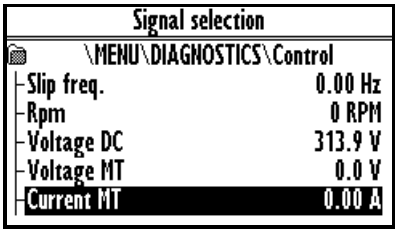
Signal name
[ID] – the identification number

Type of signal selection from the diagnostics

EXAMPLES OF THE PARAMETER, SIGNAL TYPE:

*MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG OUTPUTS \ AO1 *





Selection of the signal that will linearly recalculate the analog output AO1

Parameter type: DYNAMIC VALUE (Linked parameter) - Parameter is dynamically set to the value that is inherited from another parameter (usually from the signal type parameter).

*MENU \ SETTINGS \ INPUTS AND OUTPUTS \ RELAY OUTPUTS \ Relay 1 \ SPECIAL SETTING *

Name [ID]	Description	Def.
R1 switch on [301]	Conditions for R1 switch on.	Run |

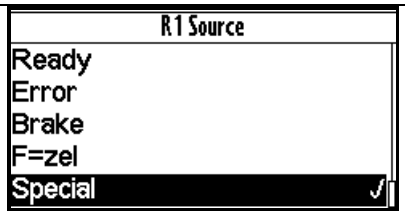
Name and ID of the dynamic parameter

Default value of the dynamic value parameter

EXAMPLES OF THE PARAMETER, DYNAMIC VALUE TYPE:

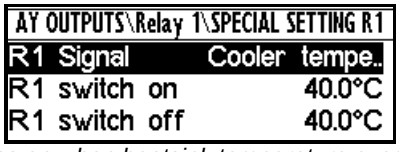
The condition for RELAY switching „R1 switch on [301]“ – If any parameter (e.g. Cooler temperature [74]) is selected as „R1 Signal [189]“:

*MENU \ SETTINGS \ INPUTS AND OUTPUTS \ RELAY OUTPUTS \ Relay 1 *



Special source of Relay R1 switch setting

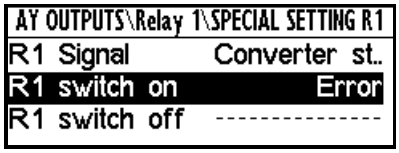
*MENU \ SETTINGS \ INPUTS AND OUTPUTS \ RELAY OUTPUTS \ Relay 1 \ SPECIAL SETTING R1 *

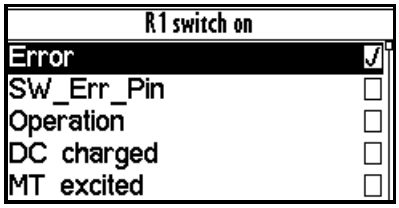


Relay R1 switches on when heatsink temperature exceeds the set level

The condition for RELAY switching „R1 switch on [301]“ – If status word is selected as „R1 Signal [189]“:

*MENU \ SETTINGS \ INPUTS AND OUTPUTS \ RELAY OUTPUTS \ Relay 1 \ SPECIAL SETTING R1 *





Relay R1 switches on at active bite (Failure) of converter status word

Parameter type: PASSWORD - Parameter to enter a password to allow access to the specific levels of converter setting respectively to unlock some of the modes.

Basic information about the importance of the parameter

MENU \ SETTINGS \ CONVERTER PARAMETERS \

Name [ID]	Description	Def.
Password [548]	Setting the user password for access to the device settings. Password needs to be entered when entering the converter settings.	0 *
0 * ÷ 0 *	Protects the converter settings against reconfiguration by unauthorized persons.	

EXAMPLE OF THE PARAMETER, PASSWORD TYPE:

Example of password entry

2.3 Type of parameters defining in the part MENU – SAVE / RESTORE:

Parameter type: PATH - Parameter of root parameters directory choice defining.

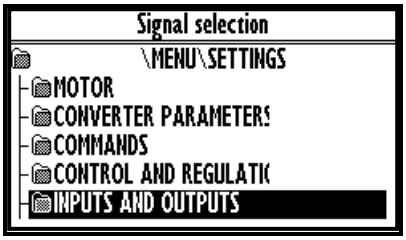
*MENU \ SAVE / RESTORE \ Parameters backup \ Parameter transfer *

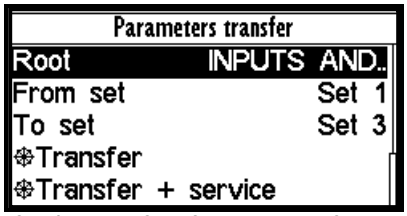
Name [ID]	Description	Def.
Directory [-]	The choice of which part of the parameters will be restored. If nothing is selected, all will be restored.	INPUTS AND OUTPUTS
0 * ÷ 0 *		

Basic information about the importance of the parameter

The selected path in the tree hierarchy

EXAMPLES OF THE PARAMETER, PATH TYPE:





INPUTS AND OUTPUTS root directory selection for the transfer of parameters from set 1 to set 3

3 Range of parameters by product type

3.1 Undervoltage, overvoltage

	Undervoltage [V]	Overvoltage [V]
Unifrem 230 M VF	220	420
Unifrem 400 VF, 400 M VF	425	735

3.2 Temperatures

	Warning line [°C]	Fault line [°C]
CB temperature [75]	55	70
Cooler temperature [74] *Unifrem 230M VF, 400 M VF* *Unifrem 400 011VF – 400 090VF*	75	90
Cooler temperature [74] *Unifrem 400 110 VF – 400 200 VF*	110	125

4 DIAGNOSTICS

Group of parameters number [2]
Diagnostic information (quantities and states).

4.1 Command

Group of parameters number [758]
Quantities affecting the converter control, inputs and outputs.

MENU \ DIAGNOSTICS \ COMMAND

Name [ID]	Description	Dim.
Freq. setpoint [162]	Frequency setpoint. Represents the value at the input of ramp block, thus the actual frequency Freq. INV [47] (page 16) is reached after the time ramps reach the setpoint.	Hz
Voltage setpoint [786]	Voltage reference value.	V
Panel freq. Setpoint [161]	Setpoint value from the panel, entered in the monitor window.	
Discrete setpoint [10]	Discrete setpoint value [60] (page 40).	
Up/down commands [977]	Output from the Up/Down commands [970] (page 42).	%/s
Control word [77]	Control signals of the converter	
□ START	Control command for the motor operation mode (1 - starts the motor).	
□ REVERZ F	Control command for the motor rotation direction (1 - reverse operation mode).	
□ RESET PWM	Control command for the immediate voltage cut-off on the converter output (active - turns off PWM).	
□ FAULT ACK.	Command for fault acknowledgement.	
□ ERR_MASTER	Master fault	
□ COMPENSATION DT	Turn on the dead time compensation mode	
□ SCALAR / VECTOR	0 - scalar control 1 - vector control.	
□ UNF BOARD TYPE	0 - UNF 400, 1 - UNF 230/400 M.	
□ RAMP_F_VSTUP0	Frequency ramp input reset.	
□ RAMP_F_VYSTUP0	Frequency ramp output reset.	
□ RAMP_F_FREEZE	Frequency ramp stop.	
□ QUICK_STOP	Quick emergency drive stop.	
□ REVERZ MOM.	Control command for changing the polarity of the torque setpoint.	
□ Reserve		

4.2 Control

Group of parameters number [759]
Quantities affecting the converter control, values of important control and operating quantities.

MENU \ DIAGNOSTICS \ CONTROL

Name [ID]	Description	Dim.
Freq. INV [47]	Frequency on the converter output. Represents the applied output voltage frequency behind the ramp block with all corrections taken into account.	Hz
Rpm [68]	Motor revolutions per minute. For correct displaying of this parameter, it is neccesary to set up Nom. revolutions [356] (page 33) correctly, according to the nameplate. This quantity is not affected by motor slip, it corresponds to the frequency setpoint.	RPM
Voltage DC	Voltage of the DC link. In a steady-state, the voltage gains its value near 1.41 x supply	V

Name [ID]	Description	Dim.
[46]	voltage RMS, which corresponds with he nominal voltage of the converter. During the braking, it can rise to the value of BM operating voltage [377] (page 48).	
Voltage MT [73]	Voltage on the motor terminals (load) is not exactly measured quantity, it is evaluated from PWM modulation index and DC link voltage (Voltage DC [46] (page 16)).	V
Current [42]	RMS value of the motor current (load).	A
Cos FI [67]	Motor power factor. Positive values indicate motoric operation and negative values indicate regenerative motor operation.	
Torque [69]	Mechanical torque on the motor shaft. The value of torque is evaluated by the mathematical motor model; its accuracy is influenced mainly by the parameters **Chyba! Nenašiel sa žiaden zdroj odkazov.** (page **Chyba! Záložka nie je definovaná.**), **Chyba! Nenašiel sa žiaden zdroj odkazov.** (page **Chyba! Záložka nie je definovaná.**) and Nom. revolutions [356] (page 33). Torque saturation is defined by the parameter **Chyba! Nenašiel sa žiaden zdroj odkazov.** (page **Chyba! Záložka nie je definovaná.**).	Nm
Modulation index [768]	PWM duty cycle of the switching power elements.	%

4.2.1 Power and energy

Group of parameters number [486]
Diagnostic group of quantities dealing with the energy indicators (power, consumption, losses).

MENU \ DIAGNOSTICS \ CONTROL \ POWER AND ENERGY

Name [ID]	Description	Dim.
Input power [70]	Active motor input power of the motor without considering any losses.	W
Power [66]	Active motor power (load), evaluated from voltage, current and power factor of the motor.	W
kWh Consumption [429]	Number of consumed kWh. This value can be reset by the command Reset the consumption [897] (page 35).	kWh
MWh Consumption [430]	Number of consumed MWh. This value can be reset by the command Reset the consumption [897] (page 35).	MWh
Power restriction [1092]	Coefficient of power restriction from external effects. At maximal allowed power or current the value 1 is acquired and when power restriction is in effect, this value is decreased to 0. Individual conditions of the power restriction can be selected in Power restriction (PR) [766] (page 49).	

4.2.2 Additional quantities

Group of parameters number [534]
Additional and derived quantities for special use.

MENU \ DIAGNOSTICS \ CONTROL \ ADDITIONAL QUANTITIES

Name [ID]	Description	Dim.
Freq. INV ramp [487]	Frequency on the ramp block output. Represents the speed controller (SC) reference in the vector control mode.	Hz
Freq. INV abs. [472]	Frequency on the converter output in an absolute value.	Hz
Rpm behind the transmission [907]	Rotation speed behind the transmission. To display it correctly, it is necessary to correctly enter the parameter Transmission ratio [888] (page 33).	RPM
Max. current [494]	Motor current RMS value limitation on the converter output. During an excessive converter load, maximal current can drop from the value Max. mot. current [5] (page 47) to the value Permanent current [24] (page 34).	A
Fast current [49]	RMS value of the non filtered motor current (load).	A
Curr. phase U [1221]	U-phase current RMS value at the output of frequency converter.	A

Name [ID]	Description	Dim.
Curr. phase V [1222]	V-phase current RMS value at the output of frequency converter.	A
Curr. phase W [1223]	W-phase current RMS value at the output of frequency converter.	A
Sum of I-AC [831]	Filtrated absolute sum of AC currents for evaluation of leak or current measurement fault.	A
Mag. Flux [71]	Stator magnetic flux. If the load is different than AC motor, it is a fictional quantity.	Wb
UL1_p2n_rms [1519]	RMS value of L1 phase-to-neutral voltage. This voltage can represent supply or generated grid voltage, according to connection.	V
UL2_p2n_rms [1520]	RMS value of L2 phase-to-neutral voltage. This voltage can represent supply or generated grid voltage, according to connection.	V
UL3_p2n_rms [1521]	RMS value of L3 phase-to-neutral voltage. This voltage can represent supply or generated grid voltage, according to connection.	V
UL1_p2p_rms [1199]	RMS value of L1 phase-to-phase voltage. This voltage can represent supply or generated grid voltage, according to connection.	V
UL2_p2p_rms [1218]	RMS value of L2 phase-to-phase voltage. This voltage can represent supply or generated grid voltage, according to connection.	V
UL3_p2p_rms [1200]	RMS value of L3 phase-to-phase voltage. This voltage can represent supply or generated grid voltage, according to connection.	V
RN reference [1170]		V
RN feedback [1190]		V

4.3 Inputs and outputs

Group of parameters number [859]
Diagnostics of the converter inputs and outputs.

4.3.1 BIN

Group of parameters number [1212]

MENU \ DIAGNOSTICS \ INPUTS AND OUTPUTS \ BIN

Name [ID]	Description	Dim.
Binary inputs [184]	State of the binary inputs. Filled rectangle represents the BINx physical switch-on.	
□ BIN1	State of 1st binary input (Terminal 1).	
□ BIN2	State of 2nd binary input (Terminal 2).	
□ BIN3	State of 3rd binary input (Terminal 3).	
□ BIN4	State of 4th binary input (Terminal 4).	
□ BIN5	State of 5th binary input (Terminal 5).	
□ BIN6	State of 6th binary input (Terminal 6).	

4.3.2 AIN

Group of parameters number [82]
Diagnostic group of quantities for the analog inputs of the converter AIN1 to AIN4.
Parameters of the analog inputs can be configured in the parameter group [144] (page 51).

MENU \ DIAGNOSTICS \ INPUTS AND OUTPUTS \ AIN

Name [ID]	Description	Dim.
AIN1 [256]	Value of the signal brought to the analog input terminals X1:11 and - X1:12 in physical units. Using the parameter AIN1 Signal [251] (page 52) select the quantity that will be changed according to the analog input level change. Parameters of the analog input can be configured in the parameter group [147] (page 51).	V
AIN1	Relative value of the signal connected to the analog input terminals + X1:11 and - X1:12.	%

Name [ID]	Description	Dim.
Rel. [41]	Parameters of the analog input can be configured in the parameter group [147] (page 51).	
AIN2 [280]	Value of the signal brought to the analog input terminals X1:13 and - X1:14 in physical units. Using the parameter AIN2 Signal [259] (page 53) select the quantity that will be changed according to the analog input level change. Parameters of the analog input can be configured in the parameter group [149] (page 52).	V
AIN2 Rel. [43]	Relative value of the signal connected to the analog input terminals + X1:13 and - X1:14. Parameters of the analog input can be configured in the parameter group [149] (page 52).	%
AIN3 [281]	Value of the signal brought to the analog input terminals X1:15 and - X1:16 in physical units. Using the parameter AIN3 Signal [269] (page 54) select the quantity that will be changed according to the analog input level change. Not available for the UNIFREM 400 M converters. Parameters of the analog input can be configured in the parameter group [148] (page 53).	V
AIN3 Rel. [44]	Relative value of the signal connected to the analog input terminals + X1:15 and - X1:16. Not available for the UNIFREM 400 M converters. Parameters of the analog input can be configured in the parameter group [148] (page 53).	%
AIN4 [282]	Value of the signal brought to the analog input terminals X1:17 and - X1:18 in physical units. Using the parameter AIN4 Signal [275] (page 55) select the quantity that will be changed according to the analog input level change. Not available for the UNIFREM 400 M converters. Parameters of the analog input can be configured in the parameter group [152] (page 54).	V
AIN4 Rel. [45]	Relative value of the signal connected to the analog input terminals + X1:17 and - X1:18. Not available for the UNIFREM 400 M converters. Parameters of the analog input can be configured in the parameter group [152] (page 54).	%

4.3.3 RELAYS

Group of parameters number [217]

MENU \ DIAGNOSTICS \ INPUTS AND OUTPUTS \ RELAYS

Name [ID]	Description	Dim.
Relay [185]	Condition of the output relays. Filled rectangle represents the RELEx physical switch-on.	
□ RELAY1	Condition of the 1st output relay.	
□ RELAY2	Condition of the 2nd output relay.	
□ RELAY3	Condition of the 3rd output relay. Not available for the converters UNIFREM 400 M.	

4.3.4 AOUT

Group of parameters number [700]
Diagnostic group of quantities for the analog inputs of the converter AOUT1 to AOUT3.

MENU \ DIAGNOSTICS \ INPUTS AND OUTPUTS \ AOUT

Name [ID]	Description	Dim.
AO1 [701]	Recalculated value of the signal on the analog input terminals X1:19 and X1:20 (X1:15 and X1:16 for UNIFREM 400 M). Using the parameter AO1 Signal [359] (page 58), select the quantity according to which the analog output level is changed. Parameters of the analog input can be configured in the parameter group [370] (page 58).	A
AO2 [702]	Recalculated value of the signal on the analog input terminals X1:21 and X1:22 (X1:17 and X1:16 for UNIFREM 400 M). Using the parameter AO2 Signal [364] (page 59), select the quantity according to which the analog output level is changed. Parameters of the analog input can be configured in the parameter group [371] (page 58).	A
AO3 [703]	Recalculated signal value on the terminals of the analog output X1:23 and X1:24. Using the parameter AO3 Signal [365] (page 60), select the quantity according to which the analog output level is changed. Not available for the UNIFREM 400 M converters. Parameters of the analog input can be configured in the parameter group [372] (page 59).	A

4.4 Functions

Group of parameters number [760]
Quantities regarding the remaining optional functions of the converter.

4.4.1 PLC function

Group of parameters number [1278]
Numerical and logical blocks output.

MENU \ DIAGNOSTICS \ FUNCTIONS \ PLC FUNCTION

Name [ID]	Description	Dim.
Logical blocks [8]	Logical operation outputs, first two LB are fast (they respond in 1ms), others are slower (10ms).	
□ LB1	LB1 status	
□ LB2	LB2 status	
□ LB3	LB3 status	
□ LB4	LB4 status	
□ LB5	LB5 status	
□ LB6	LB6 status	
□ LB7	LB7 status	
□ LB8	LB8 status	

Numerical blocks

Group of parameters number [312]
Output of numerical blocks.

MENU \ DIAGNOSTICS \ FUNCTIONS \ PLC FUNCTION \ NUMERICAL BLOCKS

Name [ID]	Description	Dim.
NB1 [1274]	Result of operation of the first numerical block.	
NB2 [1275]	Result of operation of the second numerical block.	
NB3 [1276]	Result of operation of the third numerical block.	
NB4 [1277]	Result of operation of the fourth numerical block.	

4.4.2 Limit switches

Group of parameters number [890]
States and tracks of the limit switches.

MENU \ DIAGNOSTICS \ FUNCTIONS \ LIMIT SWITCHES

Name [ID]	Description	Dim.
LS [919]	Limit switch state.	
□ LS1	LS1 inactive/active.	
□ LS2	LS2 inactive/active.	
□ LS3	LS3 inactive/active.	
□ LS4	LS4 inactive/active.	
LS1 Track [891]	Number of meters run during the activated limit switch function.	m
LS1 Track in km [929]	Number of kilometers run during the activated limit switch function.	km
LS2 Track [892]	Number of meters run during the activated limit switch function.	m
LS2 Track in km [930]	Number of kilometers run during the activated limit switch function.	km
LS3 Track [893]	Number of meters run during the activated limit switch function.	m
LS3 Track in km [931]	Number of kilometers run during the activated limit switch function.	km
LS4 Track [894]	Number of meters run during the activated limit switch function.	m
LS4 Track in km [932]	Number of kilometers run during the activated limit switch function.	km

4.4.3 Process controller

Group of parameters number [18]
Diagnostic group of the process controller quantities.

MENU \ DIAGNOSTICS \ FUNCTIONS \ PROCESS CONTROLLER

Name [ID]	Description	Dim.
Setpoint PC [21]	Setpoint value of the process controller.	%
Feedback PC [409]	Feedback value of the process controller. If the process controller is turned on and works correctly, the value is near the value Setpoint value [407] (page 73).	%
Error PC [410]	Regulation error of the process controller. In steady-state, it should be close to 0.	%
Output PC [64]	Action value (output) of the process controller.	
State PC [820]	Actual state of the process controller.	
□ Lower saturation	Process controller operates at lower saturation.	
□ Upper saturation	Process controller operates at upper saturation.	
□ Error in the dead-zone	Process controller error in the dead-zone.	
□ Positive error	Process controller error is positive.	
□ SP achieved	If error is lower than hysteresis.	
□ Parked	Process controller is parked.	
□ PC Reset	Active PC RESET - integration term and the output are equal to the value PC Reset value [1131] (page 74).	

4.4.4 Optimization

Group of parameters number [707]
Setting the parameters for the optimization block that is used to search for the extremum of any signal using the change of a selected entering setpoint signal.
Optimization searches for an output value, at which it reaches the criteria of the selected signal. During the optimization, if the measurement conditions and the operation condition are met, new output samples are counted in defined intervals. The found global extremum is stored to the memory. In case the optimization output should apply, it is necessary to select its output as the source of the setpoint value.

MENU \ DIAGNOSTICS \ FUNCTIONS \ OPTIMIZATION

Name [ID]	Description	Dim.
OPT Output [423]	Output value of the optimization block. You can watch the status and quality of the optimization process here. 100% represents the min.-max. range from the setpoint channel, which is connected to the optimization block (see [65] (page 75)).	
Optimization step [742]	Optimization step represents the difference between two consecutive optimization algorithm samples. (see [65] (page 75)).	
OPT Starting point [708]	Defines the starting point of the optimization at the optimization start, when scanning is turned off.	
OPT State [709]	Shows the present state the optimization block.	
□ Reset	Optimization is in initial or blocked state.	
□ Measuring	Measuring of the optimized quantity is running.	
□ Scan	Scanning of the whole optimization output range is running.	
□ Tuning	State of fine tuning and searching for the optimization point.	

4.4.5 Ext. thermal protection

Group of parameters number [868]
Diagnostic group of quantities of the external thermal protection (ETP).

MENU \ DIAGNOSTICS \ FUNCTIONS \ EXT. THERMAL PROTECTION

Name [ID]	Description	Dim.

Name [ID]	Description	Dim.
ETP Temperature [869]	Temperature of the ETP sensor. After exceeding the temperature defined in the parameter ETP Warning [865] (page 78), the converter generates a warning. After exceeding the temperature defined in the parameter ETP Fault [866] (page 78), the converter generates the fault " E38-ETP temperature (page 31)".	°C
ETP Current [870]	Measuring current of the external thermal protection. By rule, it is selected as the signal source of an analog input, AOUT1 to AOUT3.	mA
ETP Voltage [867]	Value of measured voltage drop on the ETP sensor.	V
Sensor resistance [871]	Resistance value of the ETP sensor. By multiple sensors connected to a series, it represents the average resistance value on one of them.	Ω

4.5 Converter state

Group of parameters number [761]
Quantities regarding the overall state of the converter and its components.

MENU \ DIAGNOSTICS \ CONVERTER STATE

Name [ID]	Description	Dim.
Voltage 24V [72]	DC control voltage of 24V. Option for the detection of the supply load caused by the control inputs and outputs. Converter generates the fault " E16-Supply overload (page 30)" when the voltage drops under 16 V.	V
Battery voltage [773]	Voltage of the battery that backs up the history logs in the converter.	V
Converter operational hours [496]	Converter operational hours. Converter operation time when switched on (RUN). This value can be reset by authorized technicians only.	h
MT operational hours [497]	Motor operational hours. Converter operation time. This value can be reset by the command Reset the motor operation hours MT [1075] (page 34).	h
Converter state [76]	Status word of the converter.	
□ Fault	Converter is in fault.	
□ SW_Err_Pin	System, internal converter status.	
□ Run	Converter generates voltage on the outputs.	
□ DC charged	DC link is charged.	
□ MT excited	Motor is excited.	
□ Accel./Decel. F	Inactive - motor accelerates, active - motor decelerates.	
□ Fsp > 0	Active - forward (+), inactive - backward (-). It is the polarity of the setpoint frequency.	
□ F = Fsp	When active, the setpoint frequency is achieved.	
□ Warning	Warning or functional message occurred in the converter.	
□ Active	Always active. It can be used as logical 1.	
□ Deexciting MT	Motor is still excited, the start is blocked.	
□ Ready	Converter is ready for the start command. (READY).	
□ Mechanical brake	Mechanical brake relay control. Brake is released when active.	
□ Motor/generator	Active - regenerative operation mode, inactive - motoric operation mode.	
□ Frot > 0	Rotor frequency polarity. If IRC is not available, then it represents the sign of the frequency evaluated by the mathematical model.	
Status word negated [547]	Negated status word.	
Look choises of parameter's Converter state [76] (page 22)		
Warning [250]	State of individual warnings.	
Warning2 [424]	State of individual warnings.	
Fault [781]	State of individual faults.	
Fault2 [780]	State of individual faults.	

4.6 Thermal protections

Group of parameters number [485]
Diagnostic group of quantities regarding the thermal protections and overloads.

MENU \ DIAGNOSTICS \ THERMAL PROTECTIONS

Name [ID]	Description	Dim.
Cooler temperature [74]	Temperature of the power elements cooler. Converter generates a warning " W6-Cooler temperature (page 27)" after exceeding the temperature set by Cooler temperature warning [767] (page 82). Converter generates the fault " E1-Cooler temperature (page 30)" after exceeding the temperature set by service parameter "Cooler temp. fault". If the temperature falls below minimal limit of sensor, this value is inaccessible. If the cooler temperature drops under the minimal measuring range, the displayed value is inaccessible.	°C
CB temperature [75]	Control board (CB) temperature. When the temperature exceeds the parameter CB temperature warning [204] (page 82) converter generates a warning " W7-CB temperature (page 27)". After exceeding the critical temperature set by service parameter "CB temper. fault" converter generates the fault " E22-CB temperature (page 30)". If the temperature falls below minimal limit of sensor, this value is inaccessible. If the temperature drops under the minimal limit of the measurement channel, the displayed value is inaccessible.	°C
Thermal integral INV [31]	Warming rate of the converter. The fault " E8-Converter overload (page 30)" is generated after exceeding 100% by this value.	%
Thermal integral INV [1219]	Time remaining until the end of fault " E8-Converter overload (page 30)".	s
Thermal integral MT [33]	Motor warming rate, the " E29-Motor overload (page 31)" fault occurs after exceeding 100%.	%
Thermal integral MT [1220]	Time remaining until the end of fault " E29-Motor overload (page 31)".	s

4.7 Communication

Group of parameters number [219]
Information regarding serial communications MODBUS, PROFIBUS, RS485, CAN.

4.7.1 MODBUS

Group of parameters number [661]
MODBUS protocol diagnostics on the RS 485 and USB ports.

MENU \ DIAGNOSTICS \ COMMUNICATION \ MODBUS

Name [ID]	Description	Dim.
Modbus setpoint value [934]	Setpoint value from the Modbus protocol.	%
SW_MODBUS [935]	State word sent over the Modbus communication. For a more detailed description, see the documentation for MODBUS communication protocol.	
Look choises of parameter's SW_PB [804] (page 24)		
CW_MODBUS [936]	Command Word sent by the Modbus master. For a more detailed description, see the documentation for MODBUS communication protocol.	

Name [ID]	Description	Dim.
Look choises of parameter's CW_PB [805] (page 24)		
Last Addr. [662]	Last received address of the device.	hex
Last Func. [663]	Last received function (may also be another device).	hex
Last register [741]	Last received register (only for this device, it is shown first if there is access to multiple registers).	hex
Last result [664]	Result of the last received function determined for this device.	hex
Last length [665]	Size (in bytes) of the last received frame over MODBUS.	
Last CRC [666]	Last received CRC (it can also be a frame for another device)	hex
Message count [740]	Count of all received messages, including error messages.	hex
CRC error count [668]	Count of all received CRC error count messages.	hex
Exception count [800]	Number of messages, which are responded by the error messages.	hex
Slave count [801]	Count of received messages with a valid device address.	hex
No response [802]	Count of received messages with a valid device address, when the device did not respond.	hex

4.7.2 PROFIBUS

Group of parameters number [817]
PROFIBUS diagnostics.

MENU \ DIAGNOSTICS \ COMMUNICATION \ PROFIBUS

Name [ID]	Description	Dim.
Profibus setpoint value [809]	Setpoint value received over the Profibus protocol.	%
SW_PB [804]	Status word sent over the Profibus communication. For a more detailed description, see the documentation for Profibus Extension Module.	
□ Ready To Switch On	Convert Reset, Quick stop are inactive, no faults or initialization are present.	
□ Ready To Operate	Converter is ready for the start command.	
□ Operation Enabled	Converter generates voltage on the outputs.	
□ Fault Present	Converter is in fault.	
□ No OFF 2	Inactive - Reset is active, outputs of the converter are blocked, active - Reset is not active.	
□ No OFF 3	Inactive - Quick stop is active, active - Quick stop is inactive.	
□ Switching On Inhibited	Reset or Quick stop are active, or an initialization or fault are present.	
□ Warning Present	Warning or functional message occurred in the converter.	
□ Speed Error within tolerance	When active, the setpoint frequency is achieved.	
□ Control Requested	Inactive - converter does not accept Control Word over communication. Acitve - converter is controlled by Control Word received over communication.	
□ F or n Reached	When active, the setpoint frequency is achieved.	
□ Run	Converter generates voltage on the outputs.	
□ Set b0	Bit 0 of active set binary combination.	
□ Set b1	Bit 1 of active set binary combination.	
□ Fsp < 0	The polarity of the setpoint frequency is backward.	
□ Bit 15	Unused	
CW_PB [805]	Command word sent by the Profibus master. For a more detailed description, see the documentation for Profibus Extension Module.	
□ ON	Converter is ready to accept the START command.	
□ No OFF 2	Inactive - Reset is active, Active - normal converter operation.	

Name [ID]	Description	Dim.
□ No OFF 3	Inactive - Quick stop is active, active - normal converter operation.	
□ Enable Operation	Start. Converter starts generating voltage on its output terminals.	
□ Enable Ramp Generator	Inactive - ramp input is set to zero, active - normal operation of the ramp input block.	
□ Unfreeze Ramp	Inactive - ramp output is frozen, active - ramp is operating normally.	
□ Enable Setpoint	Inactive - ramp input is set to zero, active - normal operation of the ramp input block.	
□ Fault Acknowledge	Fault acknowledgement (only transition inactive-active). Fault acknowledgement has to be allowed in Fault acknowledgement source [165] (page 80).	
□ Bit 8	Unused	
□ Bit 9	Unused	
□ Control by PLC	Inactive - converter does not accept Control Word. Active - converter is controlled by Control Word.	
□ Bit 11	Unused	
□ Bit 12	Unused	
□ Bit 13	Unused	
□ Bit 14	Unused	
□ Bit 15	Unused	
PB-MASTER Error [819]	Number of communication errors between the Profibus module and the Profibus master.	hex
PB-INV Error [818]	Number of communication errors between the converter and the Profibus module.	hex

4.7.3 RS LINKS

Group of parameters number [228]
Serial lines diagnostics.

MENU \ DIAGNOSTICS \ COMMUNICATION \ RS LINKS

Name [ID]	Description	Dim.
FRAME_ERR_USB [232]	USB wrongly received data count. (wrong parity, wrong stop bit,...)	
FRAME_ERR_RS485 [229]	RS 485 wrongly received data count. (wrong parity, wrong stop bit, ...)	
FRAME_ERR_EXT_MODUL [233]	RS external module wrongly received data count. (wrong parity, wrong stop bit,...)	

4.8 SW and HW version

Group of parameters number [762]
Information about the converter and its components (Mostly static information).

MENU \ DIAGNOSTICS \ SW AND HW VERSION

Name [ID]	Description	Dim.
SW Version [379]	Converter SW version	
Serial number [35]	First part of the converter unique serial number.	hex
Serial number 2 [36]	Second part of the converter unique serial number.	hex
Parameter date [380]	Parameter generating date.	
Parameter time [381]	Parameter generating time.	

4.9 Date and Time

Group of parameters number [1213]

MENU \ DIAGNOSTICS \ DATE AND TIME

Name [ID]	Description	Dim.
Date [210]	Current date.	
Time [209]	Current time.	
Day [1046]	Current day.	
□ Monday | □ Tuesday | □ Wednesday | □ Thursday | □ Friday | □ Saturday | □ Sunday		
Trial period [1006]	Number of days until the trial period of the converter expires.	d

5 WARNINGS

A sample disley	Description
F1-PWM Reset	Converter outputs are blocked. RESET sources can be a binary input or any signal (see Reset source [704] (page 36)).
W2-DC charging	If this warning is present longer than 30 seconds after the converter start, the charging relay probably did not switch, which can be caused by incorrect supply parameters, or damaged charging circuit of the converter. For the duration of the warning, the value of Voltage DC [46] (page 16) is displayed in FAULTS window.
W3-System problem	Software problem occurred. Please, contact the service.
W4-24V Overload	24V power supply voltage dropped under 22V. 24V supply is probably overloaded. For the duration of the warning, the value of Voltage 24V [72] (page 22) is displayed in FAULTS window.
F5-Power restriction	Power restriction after reaching critical temperature or an overload status. Power restriction function is configured in the parameter Power restriction (PR) [766] (page 49). For the duration of the warning, the value of Power restriction [1092] (page 17) is displayed in FAULTS window.
W6-Cooler temperature	High cooler temperature. Cooler temperature Cooler temperature [74] (page 23) exceeded the value defined by the parameter Cooler temperature warning [767] (page 82). If the automatic power restriction Power restriction (PR) [766] (page 49) function is turned on, the converter can restrict power. Life cycle of the device decreases when the device is overheated excessively and very often. For the duration of the warning, the value of Cooler temperature [74] (page 23) is displayed in FAULTS window.
W7-CB temperature	Igh temperature of control board. CB temperature CB temperature [75] (page 23) exceeded value of parameter CB temperature warning [204] (page 82). Life cycle of the device decreases when the device is overheated excessively and very often. For the duration of the warning, the value of CB temperature [75] (page 23) is displayed in FAULTS window.
W8-DC Undervoltage	Low voltage of the DC link. The value Voltage DC [46] (page 16) dropped under the fault limit DC Undervoltage - control and evaluation of other faults is blocked. For the duration of the warning, the value of Voltage DC [46] (page 16) is displayed in FAULTS window.
W9- PWM saturation	Converter reached maximum voltage on the output. At actual voltage value of the DC link, duty cycle of the PWM modulation is at maximum and the current controllers are saturated. Quality of the regulation decreases. For the duration of the warning, the value of Modulation index [768] (page 17) is displayed in FAULTS window.
W10-INV Overload	Converter is overloaded - converter integral Thermal integral INV [31] (page 23) exceeded the 90% value and the fault " E8-Converter overload (page 30)" can occur shortly, after which the converter is blocked for a longer time! If the automatic power restriction Power restriction (PR) [766] (page 49) function is turned on, the converter may restrict power. For the duration of the warning, the value of Thermal integral INV [31] (page 23) is displayed in FAULTS window.
W11-Fan error	Fans on the converter cooler are damaged or clogged by debris. If the problem is not eliminated, converter overheating and other faults and warnings can occur.
W12-Replace the battery	Voltage of the 3V battery of the control card dropped under the 2.7V value. If the battery is not replaced, loss of settings and saved history settings is impending. For the duration of the warning, the value of Battery voltage [773] (page 22) is displayed in FAULTS window.
W13-External temperature	Cooler temperature ETP Temperature [869] (page 22) exceeded the value defined by the parameter ETP Warning [865] (page 78). For the duration of the warning, the value of ETP Temperature [869] (page 22) is displayed in FAULTS window.
W14-IGBT Overheating	Power module is thermally overloaded. Converter operates at high current on high switching frequency. For the duration of the warning, the value of the maximal IGBT current is displayed in FAULTS window.
W15-Set date and	Date and time have not been set.

A sample disley	Description
time	
W16-Uncommissioned converter	The converter has not been fully commissioned yet.
W17-MT Overload	Motor is overloaded - converter integral Thermal integral MT [33] (page 23) exceeded the 90% value and the fault " E29-Motor overload (page 31)" can occur shortly, after which the converter is blocked for a longer time! For the duration of the warning, the value of Thermal integral MT [33] (page 23) is displayed in FAULTS window.
F18-Flux braking	Flux braking function is active, the motor operates at a higher magnetic flux and part of the braking energy is converter to motor heat. For the duration of the warning, the value of Mag. Flux [71] (page 18) is displayed in FAULTS window. Flux braking can be configured in [774] (page 49).
F19-Mechanical brake	Frequency setpoint is held on the brake frequency Brake frequency [522] (page 77) value, until the delay period and brake reaction Brake delay [519] (page 77) or the brake advance time Brake advance [521] (page 77) expire. For the duration of the warning, the value of Brake frequency [522] (page 77) is displayed in FAULTS window.
F20-BM braking	Brake module was activated. Excessive energy is fed to brake resistor, which is converted to heat. More information in the description of [376] (page 48). For the duration of the warning, the value of Voltage DC [46] (page 16) is displayed in FAULTS window.
W21-MT deexcitation	Waiting for the motor field deexcitation after the voltage disconnection. Until the motor is deexcited, start is not possible. Deexcitation period of the motor can be set by the parameter Time constant MT [79] (page 34). For the duration of the warning, the value of Mag. Flux [71] (page 18) is displayed in FAULTS window.
F22-Current limit	Current limit takes up. Current reached the value given by the parameter Max. mot. current [5] (page 47) or Max. regen. current [549] (page 48) and the output frequency along with the voltage is restricted. Motor is accelerating in the regenerative operation and decelerating in the motoric operation. For the duration of the warning, the value of Current [42] (page 17) is displayed in FAULTS window.
W23-Reserved	
W24-Reserved	
W25-Max. voltage	Current controller saturation. Converter is not able to generate more voltage on the output. Upper limit of generated voltage is defined by the parameter Max. voltage [495] (page 46). For the duration of the warning, the value of Voltage MT [73] (page 17) is displayed in FAULTS window.
W26-Reserved	
W27-Reserved	
W28-Reserved	
F29-Field weakening	Motor operates in the field weakening zone, to achieve higher frequencies. Motor torque decreases in this mode in reciprocal proportion to the rotation speed. For the duration of the warning, the value of Mag. Flux [71] (page 18) is displayed in FAULTS window.
W30-Reserved	
W31-Reserved	
W32-Reserved	
W33-Quick STOP	Emergency STOP was activated, after which the START is blocked. Converter will unblock after cancelling the START command with an inactive safety (quick) STOP.
F34-Quick reverse	Accelerated ramp-down Quick reverse is applied on the opposite polarity of the frequency setpoint and the ramp output. For the duration of the warning, the value of Quick reverse [807] (page 45) is displayed in FAULTS window.
W35-PC Parking	Process controller conditions to park the converter were met. For the duration of the warning, the value of Error PC [410] (page 21) is displayed in FAULTS window.
W36-Reserved	Reserved

A sample disley	Description
W37-Reserved	Reserved
W38-Motor disconnected	Motor current is too low. The motor is probably not connected or the motor parameters do not match the connected motor. For the duration of the warning, the value of Current [42] (page 17) is displayed in FAULTS window.
W39-Reserved	Reserved
W40-Reserved	Reserved
W41-Profibus Timeout	Profibus master does not communicate with the Profibus module, or the Profibus module does not communicate with the converter for a defined period of time PB Warning timeout [815] (page 87).
W42-Modbus Timeout	Modbus master does not communicate with the converter for a defined period of time MB Warning timeout [962] (page 85).
F43-Limit switch 1	Limit switch 1 is switched. Configuration is possible in the group [876] (page 70).
F44-Limit switch 2	Limit switch 2 is switched. Configuration is possible in the group [877] (page 70).
F45-Limit switch 3	Limit switch 3 is switched. Configuration is possible in the group [878] (page 71).
F46-Limit switch 4	Limit switch 4 is switched. Configuration is possible in the group [879] (page 71).
F47-Set switching	Switching to another set is activated. If the message persists, it is not possible to switch the sets (Some parameters can only be changed during stop). For the duration of the warning, the value of [222] (page 88) is displayed in FAULTS window.
F48-Restore point	Restore point for restoring the converter settings is being created.
W49-External warning	External warning signal is active. Source of the warning is configured in the parameter Ext. warning signal [965] (page 82).
W50-CPU Overload	Excessive overload of the converter control processor. Control quality decreases when this warning occurs. It is recommended to decrease the converter switching frequency Switching frequency [6] (page 34). For the duration of the warning, the value of load of the 10ms interrupt is displayed in FAULTS window.
F51-Initialization	During the initialization Initialization time [1154] (page 35) the converter ignores control commands. It is used for slower superior systems.
W52-Brake frequency	Frequency setpoint Freq. setpoint [162] (page 16) is less than Brake frequency [522] (page 77). For the duration of the warning, the value of Brake frequency [522] (page 77) is displayed in FAULTS window.
W53-BM blocking	Blocking the switching pulses of BM from the source BM blocking [1204] (page 48).
W54-Reserved	Reserved
W55-Reserved	Reserved
W56-Reserved	Reserved
W57-Reserved	Reserved
W58-Reserved	Reserved
W59-Reserved	Reserved
W60-Reserved	Reserved
W61-Reserved	Reserved
W62-Reserved	Reserved
W63-Reserved	Reserved
W64-Reserved	Reserved

6 ERRORS

A sample disley	Description
E1-Cooler temperature	Cooler temperature exceeded the allowed limit of temperature. It is necessary to increase the cooling efficiency. For the duration of the fault, the value of Cooler temperature [74] (page 23) is displayed in FAULTS window.
E2-Output phase outage	Converter evaluated the output current asymmetry, which can be caused by interrupting the output phase or damaged connected device. Fault can be turned off in the parameter Output phase loss [338] (page 79).
E3-Reserved	Reserved.
E4-Overvoltage	Voltage in DC link exceeded the maximal allowed value, which is factory preset. For the duration of the fault, the value of Voltage DC [46] (page 16) is displayed in FAULTS window.
E5-Undervoltage	Voltage in DC link dropped under the minimal allowed value, which is factory preset. For the duration of the fault, the value of Voltage DC [46] (page 16) is displayed in FAULTS window.
E6-Watchdog PWM	Fault caused by suspending or stopping of the control firmware in the DSP or during the debugging process.
E7-External fault	Signal of an external fault is active. Source of the fault is configured in the parameter Ext. fault signal [527] (page 80).
E8-Converter overload	Converter thermal overload occurred. Load character can be changed using parameter Operation mode [23] (page 34), Permanent current [24] (page 34) and the actual load rate of the converter can be tracked in the quantity Thermal integral INV [31] (page 23). For the duration of the fault, the value of Thermal integral INV [31] (page 23) is displayed in FAULTS window.
E9-System error	Serious converter fault - Call the NON-STOP service line of VONSCH s.r.o.!
E10-Overfrequency	Value Freq. INV [47] (page 16) exceeded the maximal allowed limit defined by the parameter Overfrequency limit [97] (page 80). For the duration of the fault, the value of Freq. INV [47] (page 16) is displayed in FAULTS window.
E11-Overcurrent	Exceeding the maximal allowed output current, whose value depends on the parameter Operation mode [23] (page 34) and the factory preset current overload. For the duration of the fault, the value of Current [42] (page 17) is displayed in FAULTS window.
E12-Short circuit	IGBT power module detected the short circuit, which could occur during phase-to-phase or phase-to-ground short circuit on the U,V,W terminals or during an excessive current peak caused by improper installation.
E13-Input phase loss	Converter evaluated unsymmetry of supply voltage phases which can be caused by input phase loss. Fault can be turned off in the parameter Input phase loss [337] (page 79).
E14-Safety input	Safety input on the terminal X1.7 is switched off.
E15-Reserved	Reserved.
E16-Supply overload	Voltage of the supply is outside of the allowed tolerance or a short circuit on the control terminal board occured. For the duration of the fault, the value of Voltage 24V [72] (page 22) is displayed in FAULTS window.
E17-Brake module short circuit	Brake module evaluated excessive current of the power transistor. The cause can be a BR short circuit or a faulty BM.
E18-Rectifier fault (HW ERR1)	If SKiiP module is used, rectifier fault has occurred. When other type of module is selected, this fault can be interpreted as Reserved HW fault 1.
E19-HW ERR2	Reserved HW error 2
E20-HW ERR3	Reserved HW error 3
E21-Reserved	Reserved.
E22-CB temperature	Maximal converter environment temperature of 60°C exceeded. Please, increase the cooling efficiency of the converter, or install air conditioning. For the duration of the fault, the value of CB temperature [75] (page 23) is displayed in FAULTS window.
E23-Brake module interference	Control board interference fault. Possible cause is incorrect converter installation or a strong electromagnetic interference from surrounding devices. Test of this fault can be

A sample disley	Description
	turned off in service parameters.
E24-Power module interference	Control board interference fault. Possible cause is incorrect converter installation or a strong electromagnetic interference from surrounding devices. Test of this fault can be turned off in service parameters.
E25-Interrupted AIN1	For the defined AIN Type 2 to 10 V (4 to 20mA) the AIN1 value dropped under the 1V resp. 2mA limit. Indicates the analog input interruption or a control board electronics fault. For the duration of the fault, the value of AIN1 [256] (page 18) is displayed in FAULTS window.
E26-Interrupted AIN2	For the defined AIN Type 2 to 10 V (4 to 20mA) the AIN2 value dropped under the 1V resp. 2mA limit. Indicates the analog input interruption or a control board electronics fault. For the duration of the fault, the value of AIN2 [280] (page 19) is displayed in FAULTS window.
E27-Interrupted AIN3	For the defined AIN Type 2 to 10 V (4 to 20mA) the AIN3 value dropped under the 1V resp. 2mA limit. Indicates the analog input interruption or a control board electronics fault. For the duration of the fault, the value of AIN3 [281] (page 19) is displayed in FAULTS window.
E28-Interrupted AIN4	For the defined AIN Type 2 to 10 V (4 to 20mA) the AIN4 value dropped under the 1V resp. 2mA limit. Indicates the analog input interruption or a control board electronics fault. For the duration of the fault, the value of AIN4 [282] (page 19) is displayed in FAULTS window.
E29-Motor overload	Excessive thermal overload of the motor. High temperature of the motor evaluation method is set by the parameter Motor overloading [27] (page 79). Actual status of the motor temperature integral is in Thermal integral MT [33] (page 23). For the duration of the fault, the value of Thermal integral MT [33] (page 23) is displayed in FAULTS window.
E30-Current leak/Sum I	Current leak in the output (motor) cable or HW failure of the control board - current measurement fault. It is recommended to measure leaks in the output cable. It is possible that the control board is impure by conductive impurities. Please, contact VONSCH company. For the duration of the fault, the value of Thermal integral MT [33] (page 23) is displayed in FAULTS window.
E31-Too many faults	More faults occurred that specified by the parameter Max. fault count [431] (page 81) in a time period shorter than Min. fault period [432] (page 81). For the duration of the fault, the value of number of faults is displayed in FAULTS window.
E32-IRC fault	IRC outage. Please, check the IRC cable first. IRC fault testing can be turned off in **Chyba! Nenašiel sa žiaden zdroj odkazov.** (page **Chyba! Záložka nie je definovaná.**). For the duration of the fault, the value of **Chyba! Nenašiel sa žiaden zdroj odkazov.** (page **Chyba! Záložka nie je definovaná.**) is displayed in FAULTS window.
E33-Reserved	Reserved
E34-Reserved	Reserved
E35-Reserved	Reserved
E36-FLASH error	Data could not be written into the FLASH memory. The converter control board might be damaged.
E37-Profibus Timeout	Profibus master does not communicate with the Profibus module, or the Profibus module does not communicate with the converter for a defined period of time PB Fault timeout [814] (page 87).
E38-ETP temperature	Temperature on the external temperature sensor ETP Temperature [869] (page 22) exceeded the value defined by the parameter ETP Fault [866] (page 78). For the duration of the fault, the value of ETP Temperature [869] (page 22) is displayed in FAULTS window.
E39-Settings restored	Converter configuration was not valid (long or improper storage of the converter or incorrect write to the RAM memory), so the parameters were restored from the automatic backup. For the duration of the fault, the date of the last automatic setting backup is displayed in FAULTS window.
E40-Blocked	Converter is blocked, or has invalid settings. If possible, use the restore point to restore

A sample disley	Description
converter.	settings, otherwise call the VONSCH service.
E41-Reserved	reserved
E42-Modbus Timeout	Modbus master does not communicate with the converter longer than defined period of time MB Fault timeout [659] (page 85). For the duration of the fault, the value of Slave count [801] (page 24) is displayed in FAULTS window.
E43-Reserved	Reserved
E44-Reserved	Reserved
E45-Reserved	Reserved
E46-Reserved	Reserved
E47-BM blocking	Blocking the switching pulses of BM from the source BM blocking [1204] (page 48). This fault can be turned off by parameter BM blocking fault [1205] (page 48).
E48-Reserved	Reserved
E49-IGBT Module overheating	IGBT is operated at very low voltage Vdc, high frequency of PWM switching or at currents that are not approved by the manufacturer IGBT module. Dor the duration of this fault, the value of the maximum IGBT current is displayed in FAULTS window.
E50-Reserved	reserved
E51-Reserved	reserved
E52-End of the trial period.	The trial period has expired. The motor operation is locked, please contact the supplier of frequency converter or device in which the converter is used, and ask for the conditions for termination of trial operation.
E53-Reserved	reserved
E54-Reserved	reserved

7 SETTINGS

Group of parameters number [722]
Settings of the converter parameters, load, management, control, and other components and functions of the frequency converter.

7.1 LOAD (MOTOR)

Group of parameters number [58]
Settings of the parameters of the connected motor or other three-phase appliance on the power terminals of the frequency converter (U,V,W,PE).

MENU \ SETTINGS \ LOAD (MOTOR)

Name [ID]	Description	Def.
Nom. power [357]	Nominal power of the connected device (motor, transformer...).	1100 W
10 W ÷ 1,5E6 W	If the nameplate parameters are not known, it is possible to calculate the approximate power from the nominal current and voltage.	
Nom. voltage [59]	Nominal voltage of the connected device (motor, transformer...).	400,0 V
1,0 V ÷ 1000,0 V	During the installation, it is neccesary to check whether the load (motor) connection delta/wye voltage corresponds to this value.	
Nom. frequency [4]	Nominal frequency of the connected device (motor, transformer...).	50,00 Hz
1,00 Hz ÷ 3000,00 Hz	In the V/F control mode, this parameter determines the frequency at which the V/f voltage curve reaches the value of End voltage [94] (page 43). Along with these parameters determines the V/f curve voltage and frequency ratio - motor magnetic flux	
Nom. current [151]	Nominal current of the connected device (motor, transformer...).	2,80 A
0,01 A ÷ 4000,00 A	Thermal protection of the motor (load) uses this parameter to determine the maximum allowable current for continuous operation.	
Nom. revolutions [356]	Nominal motor revolutions per minute, read from the nameplate or catalog data.	1450 rpm
100 rpm ÷ 2E6 rpm	This parameter is important for calculating the number of the motor poles **Chyba! Nenašiel sa žiaden zdroj odkazov.** (page **Chyba! Záložka nie je definovaná.**).	
Transmission ratio [888]	Transmission ratio. Rotation speed ratio before and after the transmission.	1,00000
0,00100 ÷ 10000,00000	Serves for displaying the value of Rpm behind the transmission [907] (page 17) and proper operation of the limit switch functions [875] (page 70). It is also necessary to set Transmission ratio [888] (page 33).	
Wheel circumference [889]	It represents the circumference of the wheel behind the transmission. Also serves for displaying the position value and proper operation of the limit switch functions [875] (page 70). At the same time it is also necessary to set Transmission ratio [888] (page 33).	1,0000 m
0,0001 m ÷ 100,0000 m		
Output phase sequence [326]	Setting the order of the phases on the output of the frequency converter. It replaces the physical exchange of the motor phases if it is necessary to achieve that when the motor should run in the forward direction (REVERSE inactive) it rotates in the opposite direction. It is used to set the desired direction of rotation of the connected motor or change the order of the phases on the connected device. In the single-phase PWM output mode, which is set in **Chyba! Nenašiel sa žiaden zdroj odkazov.** (page **Chyba! Záložka nie je definovaná.**), it has no effect.	Direct
Direct	Voltage is generated in the U-V-W order.	
Inverted	Voltage is generated in the V-U-W order.	

Name [ID]	Description	Def.
Time constant MT [79]	Time constant of the motor excitation.	0,120 s
0,001 s ÷ 10,000 s	This parameter influences the motor excitation speed and is necessary for the correct function of the motor mathematical model.	
MT deexcitation time [1171]	Motor deexcitation time after PWM turning off.	1,00
0,00 ÷ 10,00	Represents multiple of Time constant MT [79] (page 34) parameter value, during which PWM outputs are blocked after previous PWM turning off.	
Reset the motor operation hours MT [1075]	This command resets the operation hours of the motor MT operational hours [497] (page 22).	
Set motohours MT [502]	By changing this parameter, it is possible to preset operation hours of the motor MT operational hours [497] (page 22).	0,0 h
0,0 h ÷ 200000,0 h		

7.2 CONVERTER PARAMETERS

Group of parameters number [197]
Operating parameters of the converter.

7.2.1 APPLICATION MACROS

Group of parameters number [1491]
Application macros. It configures the converter parameters for the most used applications.

MENU \ SETTINGS \ CONVERTER PARAMETERS \ APPLICATION MACROS

Name [ID]	Description	Def.
Motor 50Hz [1492]	Application macro for 50Hz induction motor control.	
Artificial AC mains 50 Hz [1495]	Application macro fo artificial AC mains 50 Hz.	
Artificial AC mains 60 Hz [1493]	Application macro fo artificial AC mains 60 Hz.	
Artificial AC mains - single-phase [1494]	Application macro for single phase artificial AC mains.	
Switching frequency [6]	Switching frequency of the PWM modulation of output voltages.	10000 Hz
1150 ÷ 20000	Switching frequency of the impulses of the converter power elements. For decreasing the value of acoustic noise, it is possible to increase this value. However, the thermal losses will increase and the maximum current of the converter might decrease.	
Permanent current [24]	The current threshold for a long-term (permanent) converter load. The value represents the ratio between permanent current and the nominal current of the converter.	1,000
0,500 ÷ $(I_{NQ} / I_{NK})^5$	If output current exceeds this value, the converter can generate the fault " E8-Converter overload (page 30)". Changing the nature of the converter load in the Operation mode [23] (page 34) parameter resets the parameter value to the production value for the specified load type and the specified converter type. By setting this value to higher than factory setting, it allows converter to feed permanently higher current, but it decreases short-term overload factor. [5]*The value depends on the inverter power line. See installation manual.*	
Operation mode	Selection of the converter load operation mode. Threshold current for	Variable

Name [ID]	Description	Def.
[23]	specific operation modes is factory preset.	load
Constant load	Loading mode for dynamically varying loads, which have constant character of the torque to the motor frequency. The drive allows higher short-term overload and lower permanent load. For example: cranes, mills, conveyors, machines...	
Variable load	Loading mode for static loads, which have an exponentially growing character of the torque to the motor frequency. The converter allows lower short-term overload and a higher permanent load. For example : Pumps, Fans, Generators, ...	
Initialization time [1154]	This time extends the initialization time. During the initialization time, start is not possible and the faults are not evaluated. Parameter serves for delaying the response time for slower control systems.	0 s
0 s ÷ 3600 s		
Password [548]	Setting the user password for access to the device settings. Password needs to be entered when entering the converter settings.	****
**** ÷ ****	Protects the converter settings against reconfiguration by unauthorized persons.	
DST Time shift [770]	Determines whether the time of the converter is only in the normal time, or it is changed when needed to normal or daylight saving time.	DST automatic change
No DST | DST automatic change		
Converter unblocking [1007]	Parameter for entering the password to unlock the converter from the trial period mode to operation mode. For unblocking the converter, please contact the supplier of frequency converter or device in which the converter is used, and ask for the conditions for termination of trial operation.	****
**** ÷ ****		
Sine filter (SF) [237]	Presence of sine filter at the converters output.	Not present
Not present	SF is not connected to the converter outputs.	
Present	SF is connected to the converter outputs, the lower limit of switching frequency is increased and the dynamics of controllers in vector control mode is reduced.	

7.2.2 ENERGY CONS.

Group of parameters number [236]
Preset or reset of the consumed energy counters kWh Consumption [429] (page 17) a MWh Consumption [430] (page 17).

MENU \ SETTINGS \ CONVERTER PARAMETERS \ ENERGY CONS.

Name [ID]	Description	Def.
Reset the consumption [897]	This command resets the counters of consumed energy.	
Consumption reset source [900]	Special reset source of the consumed converter energy.	
Look choises of parameter's Bit1 DS mask [553] (page 41)		

7.3 COMMANDS

Group of parameters number [1]
Command settings for converter and motor

7.3.1 COMMAND MACROS

Group of parameters number [1503]
Command macros for quick configuration of converter commands.

MENU \ SETTINGS \ COMMANDS \ COMMAND MACROS

Name [ID]	Description	Def.
Control panel [1504]	Command macro for command over the UNIPANEL control panel.	

Name [ID]	Description	Def.
Binary [1505]	Command macro for command over the binary inputs. This is a basic preset, it should be adjusted manually.	

7.3.2 START STOP RESET

Group of parameters number [192]

MENU \ SETTINGS \ COMMANDS \ START STOP RESET

Name [ID]	Description	Def.
Start source [194]	Setting the converter start source. The START command generates the desired voltage and frequency on the U,V,W outputs (or U,V for a single phase load).	BIN1
Control panel	Pressing the green START button on the control panel causes the converter to start. The start is canceled by pressing the red STOP button.	
Permanent start	The converter starts immediately after the switch-on.	
BIN1	The converter start after the activation of the 1st binary input.	
BIN2	The converter starts after the activation of the 2nd binary input.	
BIN3	The converter starts after the activation of the 3rd binary input.	
BIN1, 2	The converter starts after the activation of the 1st or 2nd binary input.	
BIN1, 3	The converter starts after the activation of the 1st or 3rd binary input.	
BIN1, 4	The converter starts after the activation of the 1st or 4th binary input.	
MODBUS	The converter start is controlled over the serial communication. See the MODBUS serial communication protocol.	
PROFIBUS	The converter start is controlled over the serial communication. See the PROFIBUS serial communication protocol.	
Special	The converter start is controlled by a special preset signal and switching thresholds, see [987] (page 37).	
MODBUS 2	The converter start is controlled over the serial communication. See the MODBUS serial communication protocol.	
Reset source [704]	Setting the converter reset source. PWM generating will be turned off. It can be used as an emergency stop. No fault will be generated, only a warning. RESET is needed for example in applications where the motors are switched at the output. Before switching the power output, PWM outputs should be blocked, otherwise there is a high risk of damage to the power elements of the converter.	BIN4
Look choises of parameter's Quick stop source. [986] (page 36)		
Quick stop source. [986]	Setting the source of the quick stop. It is necessary to cancel and then start the converter start command again for the converter to start after a quick stop. It is used to stop the machinery with working personnel, which comes into contact with the rotating parts. For example, signal light barrier or door limit switch. When active, the drive will stop by following the faster deceleration ramp, defined by the time parameter Quick STOP [806] (page 36).	None
None	Function is inactive.	
BIN1	Function is activated by activation of the 1st binary input.	
BIN2	Function is activated by activation of the 2nd binary input.	
BIN3	Function is activated by activation of the 3rd binary input.	
BIN4	Function is activated by activation of the 4th binary input.	
BIN5	Function is activated by activation of the 5th binary input.	
BIN6	Function is activated by activation of the 6th binary input.	
Special	Function is activated by a special preset signal and switching thresholds	
Quick STOP [806]	Realtive value of ramp-down time when activating the Quick stop Quick stop source. [986] (page 36).	10,0 %
0,1 % ÷ 100,0 %		

SPECIAL SETTING

Group of parameters number [215]
Special source setting for the START, STOP and RESET.

SPECIAL START

Group of parameters number [987]
Special source setting of Start.

MENU \ SETTINGS \ COMMANDS \ START STOP RESET \ SPECIAL SETTING \ SPECIAL START

Name [ID]	Description	Def.
Start signal [503]	Selection of the signal for Start control.	[184] Binary inputs
Signal		
Start active [504]	The condition for activation the Start.	BIN1
Look choises of parameter's Binary inputs [184] (page 18)		
Start inactive [505]	The condition for deactivation the Start, when selected signal is of numeric type "value".	
Look choises of parameter's Binary inputs [184] (page 18)		

SPECIAL RESET

Group of parameters number [333]
Special RESET setting.

MENU \ SETTINGS \ COMMANDS \ START STOP RESET \ SPECIAL SETTING \ SPECIAL RESET

Name [ID]	Description	Def.
Reset signal [524]	Selection of the signal for RESET control.	[184] Binary inputs
Signal		
Reset active [525]	The condition for activation of RESET.	BIN4
Look choises of parameter's Binary inputs [184] (page 18)		
Reset inactive [526]	The condition for deactivation of RESET, when selected signal is of numeric type "value".	
Look choises of parameter's Binary inputs [184] (page 18)		

SPECIAL QUICK STOP

Group of parameters number [989]
Setting the special source of the Quick Stop.

MENU \ SETTINGS \ COMMANDS \ START STOP RESET \ SPECIAL SETTING \ SPECIAL QUICK STOP

Name [ID]	Description	Def.
Quick stop signal [821]	Selection of the signal for Quick Stop control.	[184] Binary inputs
Signal		
Quick stop active [822]	The condition for activation of Quick Stop.	
Look choises of parameter's Binary inputs [184] (page 18)		
Quick stop inactive [823]	The condition for deactivation of Quick Stop, when selected signal is of numeric type "value".	
Look choises of parameter's Binary inputs [184] (page 18)		
Start delay [1238]	Delay between receiving START command and its execution.	0,000 s

Name [ID]	Description	Def.
0,000 s ÷ 300,000 s		
Stop delay [1487]	Delay between receiving STOP command and its execution.	0,000 s
0,000 s ÷ 300,000 s		

7.3.3 FREQUENCY SETPOINT

Group of parameters number [7]
Setting of frequency setpoint of the converter.

MENU \ SETTINGS \ COMMANDS \ FREQUENCY SETPOINT

Name [ID]	Description	Def.
Source of freq. setpoint [706]	Setting the source of the frequency setpoint.	AIN1
Value	The source of the setpoint is fixed value.	
Control panel	The source of the setpoint are arrow keys in the MONITOR window in the control panel.	
AIN1	The source of the setpoint is the corresponding analog input.	
AIN2	The source of the setpoint is the corresponding analog input.	
AIN3	The source of the setpoint is the corresponding analog input.	
AIN4	The source of the setpoint is the corresponding analog input.	
Discrete setpoints	The source of the setpoint are the discrete setpoint values [60] (page 40). It is not possible to select this setting if the discrete setpoint speeds are assigned elsewhere (e.g. Source of PC setpoint [130] (page 73)).	
Up/down commands	The source of the setpoint are the up/down commands, please see [970] (page 42).	
Process controller	The source of the setpoint is the process controller, please see [385] (page 72).	
MODBUS	The source of the setpoint is the MODBUS serial communication, please see [658] (page 84).	
PROFIBUS	The source of the setpoint is the PROFIBUS serial communication, please see [812] (page 87).	
Special	The source of the setpoint is the special setting.	
Maximal value	The source of the setpoint is the maximum value of the quantity range.	
Setpoint frequency [344]	Fixed value of the setpoint frequency.	0,00 Hz
Min.[7] ÷ Max. frequency [111]	*[7]Value depends on the parameter* **Freq. reverse source [195]** *(str. 38). For the choice „According to the setpoint value“ is from -(***Max. frequency [111]** *(str. 44)), for other choices is from* **Min. frequency [110]** *(str. 43).*	
Freq. reverse source [195]	Setting the reverse source of the motor frequency setpoint.	BIN6
Control panel	Pressing the gray REVERSE button on the control panel causes the motor reverse.	
No reverse	The motor will always turn in a positive direction, it is the forward direction.	
Permanent reverse	The motor will always turn in a negative direction, it is the backward direction.	
BIN1	Reverse is activated by 1st binary input.	
BIN2	Reverse is activated by 2nd binary input.	
BIN3	Reverse is activated by 3rd binary input.	
BIN4	Reverse is activated by 4th binary input.	
BIN5	Reverse is activated by 5th binary input.	
BIN6	Reverse is activated by 6th binary input.	
According to the setpoint value	Rotating direction is dependent on the frequency setpoint polarity Setpoint frequency [344] (page 38).	
MODBUS	The motor reverse is controlled over the serial communication. See the MODBUS serial communication protocol.	
PROFIBUS	The motor reverse is controlled over the serial communication. See the PROFIBUS serial	

Name [ID]	Description	Def.
	communication protocol.	
Special	The motor reverse is controlled by the special setting [988] (page 39).	
Fsetpoint reset in stop [1152]	Method of frequency setpoint channel storing or reset.	No
No	Frequency setpoint always equals the selected source.	
Yes	While in stop, the setpoint frequency is always set to 0 Hz.	
Fsetpoint transfer [1153]	Setting the behavior of freq. setpoint	During power off
■ During power off	The converter keeps the setpoint value after the power off.	
□ During set change	Setpoint value is transferred between the parameter sets.	

SPECIAL SETTING
Group of parameters number [988]
Setting a special source for the frequency setpoint and reverse.

MENU \ SETTINGS \ COMMANDS \ FREQUENCY SETPOINT \ SPECIAL SETTING

Name [ID]	Description	Def.
Freq. setpoint signal [30]	Selection of the parameter that represents the frequency setpoint value.	[256] AIN1
Signal		
F Reverse signal [506]	Selection of the signal for Reverse control.	[184] Binary inputs
Signal		
Reverse F active [507]	The condition for activating the Reverse.	BIN6
Look choises of parameter's Binary inputs [184] (page 18)		
Reverse F inactive [508]	The condition for deactivation of Reverse, when selected signal is of numeric type "value".	
Look choises of parameter's Binary inputs [184] (page 18)		

7.3.4 VOLTAGE SETPOINT
Group of parameters number [787]

MENU \ SETTINGS \ COMMANDS \ VOLTAGE SETPOINT

Name [ID]	Description	Def.
Voltage setpoint [789]	Fixed value of the voltage setpoint on the converter output.	400 V
Min. V[8] ÷ Max. V[9]	If the V/f curve is activated (V/f Curve [782] (page 43)), voltage setpoint is taken into account on the V/f curve gradient, thus it controls the end voltage. [8]*Value is multiple of parameters* **Nom. voltage [59]** *(str. 33) and* **Starting voltage (min) [90]** *(str. 43).* [9]*Value depends on the parameter* **V/f Curve [782]** *(str. 43). For the choice „Turned on“ is multiple of parameters* **Nom. voltage [59]** *(str. 33) a* **End voltage [94]** *(str. 43). For the choice „Turned off“ is multiple of parameters* **Nom. voltage [59]** *(str. 33) a %p495.*	
Signal for VS [790]	Selection of the parameter that represents the voltage setpoint value.	-
Signal	If the V/f curve is activated (V/f Curve [782] (page 43)), voltage setpoint is taken into account on the V/f curve gradient, thus it controls the end voltage.	

7.3.5 DISCRETE SETPOINTS

Group of parameters number [60]
Discrete setpoint value setting.
Discrete setpoint values can serve as the setpoint values signals for any quantity as exact, predefined values.

MENU \ SETTINGS \ COMMANDS \ DISCRETE SETPOINTS

Name [ID]	Description	Def.
Discrete setpoint switch [576]	Discrete setpoint value switch type setting.	Single
Combined	Only the first 3 bits of the DS switch are used. Output value corresponds to the binary combination of these bits. If no bits are active, the Value Value 0 [220] (page 40) is on the output. If only 1 bit is active, the Value Value 1 [239] (page 40) is on the output and so on.	
Single	Every single bit of the DS switch stands for one discrete setpoint value (1.bit stands for the 1. value and so on.). If there are more DS switches active, value with the higher switching bit is on the output. If no DS switch is active, discrete value 0 is on the output.	

DISCRETE VALUES

Group of parameters number [84]
Single discrete value setting. It is possible to set the value only when the signal Discrete setpoint [10] (page 16) is connected. Physical dimension and range of values are inherited according to the target where the signal is connected.
Warning! When configuring speed control of a crane drive, it might be necessary to set Value 0 [220] (page 40) a Value 1 [239] (page 40) to the same value.

MENU \ SETTINGS \ COMMANDS \ DISCRETE SETPOINTS \ DISCRETE VALUES

Name [ID]	Description	Def.
Value 0 [220]	Zero value of the discrete setpoint value. This value applies, when no switch bit is set.	-
- ÷ -		
Value 1 [239]	First value of the discrete setpoint value.	-
- ÷ -		
Value 2 [245]	Second value of the discrete setpoint value.	-
- ÷ -		
Value 3 [293]	Third value of the discrete setpoint value.	-
- ÷ -		
Value 4 [475]	Fourth value of the discrete setpoint value.	-
- ÷ -		
Value 5 [299]	Fifth value of the discrete setpoint value.	-
- ÷ -		
Value 6 [550]	Sixth value of the discrete setpoint value.	-
- ÷ -		
Value 7 [551]	Seventh value of the discrete setpoint value.	-
- ÷ -		

DS SWITCH

Group of parameters number [100]
Binary switch setting for switching the discrete setpoint values.

MENU \ SETTINGS \ COMMANDS \ DISCRETE SETPOINTS \ DS SWITCH

Name [ID]	Description	Def.
Bit1 DS source [552]	Bit source setting for the binary switch for the discrete setpoint values. Its function depends on the Discrete setpoint switch [576] (page 40) parameter setting.	None
Look choises of parameter's Quick stop source. [986] (page 36)		

Name [ID]	Description	Def.
Bit2 DS source [555]	See Bit1 DS source [552] (page 40).	None
Look choises of parameter's Quick stop source. [986] (page 36)		
Bit3 DS source [558]	See Bit1 DS source [552] (page 40).	None
Look choises of parameter's Quick stop source. [986] (page 36)		
Bit4 DS source [561]	See Bit1 DS source [552] (page 40).	None
Look choises of parameter's Quick stop source. [986] (page 36)		
Bit5 DS source [564]	See Bit1 DS source [552] (page 40).	None
Look choises of parameter's Quick stop source. [986] (page 36)		
Bit6 DS source [567]	See Bit1 DS source [552] (page 40).	None
Look choises of parameter's Quick stop source. [986] (page 36)		
Bit7 DS source [570]	See Bit1 DS source [552] (page 40).	None
Look choises of parameter's Quick stop source. [986] (page 36)		

SPECIAL SETTING DS

Group of parameters number [235]
Binary switch special setting.

MENU \ SETTINGS \ COMMANDS \ DISCRETE SETPOINTS \ DS SWITCH \ SPECIAL SETTING DS

Name [ID]	Description	Def.
Bit1 DS mask [553]	Binary switch bit will be active if at least one of the selected binary inputs or logical blocks will be active.	
□ BIN1		
□ BIN2		
□ BIN3		
□ BIN4		
□ BIN5		
□ BIN6		
□ Logical block1		
□ Logical block2		
□ Logical block3		
□ Logical block4		
□ Logical block5		
□ Logical block6		
□ Logical block7		
□ Logical block8		
□ Active	Always active. It can be used as logical 1.	
Bit2 DS mask [556]	See Bit1 DS mask [553] (page 41).	
Look choises of parameter's Bit1 DS mask [553] (page 41)		
Bit3 DS mask [559]	See Bit1 DS mask [553] (page 41).	
Look choises of parameter's Bit1 DS mask [553] (page 41)		
Bit4 DS mask [562]	See Bit1 DS mask [553] (page 41).	
Look choises of parameter's Bit1 DS mask [553] (page 41)		

Name [ID]	Description	Def.
Bit5 DS mask [565]	See Bit1 DS mask [553] (page 41).	
Look choises of parameter's Bit1 DS mask [553] (page 41)		
Bit6 DS mask [568]	See Bit1 DS mask [553] (page 41).	
Look choises of parameter's Bit1 DS mask [553] (page 41)		
Bit7 DS mask [571]	See Bit1 DS mask [553] (page 41).	
Look choises of parameter's Bit1 DS mask [553] (page 41)		

7.3.6 UP/DOWN COMMANDS

Group of parameters number [970]
Up/down commands serves for entering the setpoint value using the up (increase) and down (decrease) commands.

MENU \ SETTINGS \ COMMANDS \ UP/DOWN COMMANDS

Name [ID]	Description	Def.
UP/DOWN Type [978]	Defines the type of Up/Down commands function.	Type 1
Type 1	Both the up and down commands are applied. Converter stores the last set value in the memory. Stands for the common motor-potentiometer in the VQFREM converters.	
Type 2	Only the up command is applied. The down command is applied automatically on the converter stop. Converter does not store the last set value in the memory. Stands for the common memory motor-potentiometer in the VQFREM converters.	
MP slope [979]		0,01 %/s
0,01 %/s ÷ 100,00 %/s		
Source of up command [971]	Setting the source for the up command.	None
Look choises of parameter's Quick stop source. [986] (page 36)		
Source of Down [974]	Setting the source for the down command.	None
Look choises of parameter's Quick stop source. [986] (page 36)		

SPECIAL SETTING

Group of parameters number [138]
Special source setting for up and down commands.

MENU \ SETTINGS \ COMMANDS \ UP/DOWN COMMANDS \ SPECIAL SETTING

Name [ID]	Description	Def.
Up mask [972]	Up command will be active if at least one of the selected binary inputs or logical blocks will be active.	
Look choises of parameter's Bit1 DS mask [553] (page 41)		
Down mask [975]	Down command will be active if at least one of the selected binary inputs or logical blocks will be active.	
Look choises of parameter's Bit1 DS mask [553] (page 41)		

7.4 CONTROL AND REGULATION

Group of parameters number [11]
Settings of the motor control parameters.

7.4.1 V/f CONTROL

Group of parameters number [81]
Setting the dependence between the output voltage and the frequency (V/f curve) and operation modes designated for the motor V/f (scalar) control.

MENU \ SETTINGS \ CONTROL AND REGULATION \ V/F CONTROL

Name [ID]	Description	Def.
V/f Curve [782]	Voltage setpoint calculation setting.	Turned on
Turned on	Voltage depends on the frequency according to the V/f curve.	
Turned off	Voltage and frequency are controlled independently.	
Starting voltage (min) [90]	Starting voltage of the V/f curve and minimum limit of the output voltage which corresponds the percentage value of the nominal load voltage.	7,00 %
0,10 ÷ End voltage [94]	Starting voltage which will be set on the output on zero frequency. Represents the rate of the initial start if the device. Too high value can cause a failure on the startup E10-Overfrequency (page 30). Also defines the minimal threshold for the voltage setpoint range when the V/f curve is disabled.	
End voltage [94]	End voltage of the V/f curve.	100,0 %
0,1 % ÷ 500,0 %	Voltage that corresponds with the nominal frequency Nom. frequency [4] (page 33) and directly influences the load excitation level. When increasing the frequency beyond the nominal frequency Nom. frequency [4] (page 33), the voltage value stays at this limit. This parameter has no meaning when the V/f curve is disabled V/f Curve [782] (page 43).	

V/f CURVE

Group of parameters number [382]
Setting the dependence between the ouput voltage and the output frequency (V/f curve).

MENU \ SETTINGS \ CONTROL AND REGULATION \ V/F CONTROL \ V/F CURVE

Name [ID]	Description	Def.
Frequency shift [98]	Frequency shift of the V/f curve.	3,0 Hz
0,0 ÷ Nom. frequency [4]	Frequency value that divides the V/f characteristics to the high-excitation area (frequency lower that the F shift) and the normal excitation area (frequency higher that the F shift).	
V/f exponent [91]	V/f curve exponent.	1,00
1,00 ÷ 2,00	Affects the curvature of the whole V/f curve to an exponential shape. The exponent value 1.00 represents the linear shape and the value 2.00 a quadratic process. Using the exponential V/f curve has its significance in pumps and fans, where the load torque grows with the rotation speed and field weakening of the motor is allowed at low speed to save energy.	
Exp. shift V/f [92]	V/f curve shift exponent in the range from 0 Hz to Frequency shift [98] (page 43).	1,00
1,00 ÷ 2,00	Affects the curvature of the V/f curve in the area to Frequency shift [98] (page 43). The exponent value 1.00 represents the linear shape and the value 2.00 a quadratic process. Using an exponent, it is possible to control the non-linear features of induction motor better near zero frequency .	

7.4.2 FREQUENCY RAMPS

Group of parameters number [106]
Setting the times for ramp-up, ramp-down and the output frequency limits.

MENU \ SETTINGS \ CONTROL AND REGULATION \ FREQUENCY RAMPS

Name [ID]	Description	Def.
Min.	Minimal frequency.	0,00 Hz

Name [ID]	Description	Def.
frequency [110]		
0,00 ÷ Max. frequency [111]	Using the minimal frequency, it is possible to define the maximal operating speed of the drive, which is superior to all other ways of entering the speed. For example, defining the minimal speed of the pump during the pressure regulation, to ensure lubrication and cooling of bearings and sealings.	
Max. frequency [111]	Maximal frequency.	50,00 Hz
0,00 Hz ÷ 3000,00 Hz	Using the maximal frequency, it is possible to define the maximal operating speed of the drive, which is superior to all other ways of entering the speed.	
Ramp type [107]	Setting the method of entering the frequency ramp parameters.	Time adherent
Time adherent	For setting the ramp speed, the ramp-up (Ramp-up 1 time [116] (page 44), Ramp-up 2 time [118] (page 44)) and ramp-down (Ramp-down 1 time [119] (page 45), Ramp-down 2 time [120] (page 45)) time parameters [s] for single sections will apply.	
Slope adherent	For setting the ramp speed, the ramp-up (Ramp-up 1 slope [124] (page 44), Ramp-up 2 slope [126] (page 44)) and ramp-down (Ramp-down 1 slope [127] (page 45), Ramp-down 2 slope [129] (page 45)) slope parameters [Hz/s] for single sections will apply.	

RAMP-UP

Group of parameters number [108]
Ramp-up settings. Restriction of motor acceleration.

MENU \ SETTINGS \ CONTROL AND REGULATION \ FREQUENCY RAMPS \ RAMP-UP

Name [ID]	Description	Def.
Ramp-up 1 time [116]	Ramp-up time for the first section of the frequency ramp.	5,00 s
0,00 s ÷ 3000,00 s	First section of the ramp-up is from 0 Hz till the Ramp-up break [117] (page 44) value.	
Ramp-up 2 time [118]	Ramp-up time for the second section of the frequency ramp.	5,00 s
0,00 s ÷ 3000,00 s	Second section of the ramp-up is from the value Ramp-up break [117] (page 44) to the parameter value Max. frequency [111] (page 44).	
Ramp-up break [117]	Ramp-up break for the first section of the frequency ramp.	50,00 Hz
0,00 ÷ Max. frequency [111]	If the ramp should be simple (single section), set this parameter to its maximum value.	
Ramp-up 1 slope [124]	Setting the ramp-up slope from zero frequency to the frequency Ramp-up break [117] (page 44).	5,000 Hz/s
0,001 Hz/s ÷ 30000,000 Hz/s	It is actually the frequency ramp acceleration in the first ramp-up section.	
Ramp-up 2 slope [126]	Setting the ramp-up slope from frequency Ramp-up break [117] (page 44) to the frequency Max. frequency [111] (page 44).	5,000 Hz/s
0,001 Hz/s ÷ 30000,000 Hz/s	It is actually the frequency ramp acceleration in the second ramp-up section.	

RAMP-DOWN

Group of parameters number [115]
Ramp-down settings. Restriction of motor deceleration.

MENU \ SETTINGS \ CONTROL AND REGULATION \ FREQUENCY RAMPS \ RAMP-DOWN

Name [ID]	Description	Def.

Name [ID]	Description	Def.
Ramp-down 1 time [119]	Ramp-down time for the first section of the frequency ramp.	5,00 s
0,00 s ÷ 3000,00 s	First section of the ramp-down is from the value Ramp-down break [121] (page 45) to 0 Hz.	
Ramp-down 2 time [120]	Ramp-down time for the second section of the frequency ramp.	5,00 s
0,00 s ÷ 3000,00 s	Second section of the ramp-down is from the value Max. frequency [111] (page 44) to the parameter value Ramp-down break [121] (page 45).	
Ramp-down break [121]	Ramp-down break of the frequency ramp.	50,00 Hz
0,00 ÷ Max. frequency [111]	If the ramp should be simple (single section), set this parameter to its maximum value.	
Ramp-down 1 slope [127]	Setting the ramp-down slope Ramp-down break [121] (page 45) to zero frequency.	5,000 Hz/s
0,001 Hz/s ÷ 30000,000 Hz/s	The frequency ramp deceleration in the first ramp-down section.	
Ramp-down 2 slope [129]	Setting the ramp-down slope from frequency Max. frequency [111] (page 44) to the frequency Ramp-down break [121] (page 45).	5,000 Hz/s
0,001 Hz/s ÷ 30000,000 Hz/s	The frequency ramp deceleration in the second ramp-down section.	
Quick reverse [807]	Setting of the accelerated ramp-down speed against the defined ramp-down, when the frequency setpoint has the opposite symbol as the frequency ramp output (Quick reverse command).	100,0 %
0,1 % ÷ 1000,0 %	The Quick reverse function serves for better drive control on manual control, mainly in cranes and transport vehicles. For the Quick reverse function it is necessary to dissipate the kinetic energy through a braking module or flux braking.	

S-CURVE

Group of parameters number [872]
Setting the curvature of the frequency profile to the S shape.
Serves for the drive recoil restriction and a smoother operation of the device. It is mainly used for lift, traction and crane applications.

MENU \ SETTINGS \ CONTROL AND REGULATION \ FREQUENCY RAMPS \ S-CURVE

Name [ID]	Description	Def.
S-curve mode [874]	Turning on / off and the selection of the S-curve operation mode.	
□ Turning on the S-curve	Turning on the curvature of the ramp functions. This option is superior to other optional S-curve modes in individual quadrants of the drive.	
□ S-curve ramp-up +	Turning on / off the S-curve for ramp-up from 0 to positive frequency.	
□ S-curve ramp-down +	Turning on / off the S-curve for ramp-down from positive frequency to 0.	
□ S-curve ramp-up -	Turning on / off the S-curve for ramp-up from 0 to negative frequency.	
□ S-curve ramp-down -	Turning on / off the S-curve for ramp-down from negative frequency to 0.	
□ S splitting	Splitting the S-curve to two separate S sections if the ramp passes 0Hz on ramp-up.	
□ Higher insensitivity	Setting the 5x higher insensitivity to changes of the frequency setpoint against the standard insensitivity +/- 0.01 % from Fnom. Insensitivity secures the operation of S-curves even on interfered frequency setpoint signals (for example AINx).	
S-curve curvature	Setting the curvature of the S-curve. It is the curvature degree of the characteristics.	100,0 %

Name [ID]	Description	Def.
[873]		
1,0 % ÷ 100,0 %	When curvature equals 100%, the linear section will not be present during the ramp operation. When curvature equals 50%, there will be a linear section in the middle of the S-curve with the duration of 50% of the total time. When curvature equals 0%, the whole ramp is linear. ATTENTION! BY 100% curvature, the time needed to reach the frequency setpoint is double the time that is needed for the linear frequency ramp.	

7.4.3 VOLTAGE RAMP

Group of parameters number [976]

Ramp settings for voltage setpoint. If the V/f curve is turned on V/f Curve [782] (page 43) voltage ramp output is set to voltage setpoint in STOP or it corrects the slope of the V/f curve in START. If the V/f curve is turned off, it is preset to the value of Starting voltage (min) [90] (page 43) in STOP or it directly controls the output converter voltage in START.

MENU \ SETTINGS \ CONTROL AND REGULATION \ VOLTAGE RAMP

Name [ID]	Description	Def.
Max. voltage [495]	Setting the voltage limit on the output of the frequency converter.	100,0 %
5,0 % ÷ 500,0 %	In scalar control, voltage is limited to this value. In vector control it is used as saturation of the output of current controllers. Represents a percentage of the nominal voltage of the motor Nom. voltage [59] (page 33). This means that if the DC link has sufficient voltage it is possible to supply higher voltage to the motor . If the inverter is made for 400V and motor for 230V, by setting this parameter to 174%, an increase in motor power and operation with nominal torque up to 87Hz is achieved.	
Max. duty cycle [1289]	Maximum allowed duty cycle of the converter output power elements.	100,0 %
0,0 % ÷ 500,0 %	This parameter limits the overmodulation and thus higher harmonic components of voltages and currents at the moment, when there is not not sufficient DC bus voltage. It can be combined with a higher value of the parameter Max. voltage [495] (page 46).	
Rise time [791]	Voltage setpoint rise time from 0V to the parameter value Nom. voltage [59] (page 33).	5,00 s
0,00 s ÷ 3600,00 s		
Fall time [792]	Voltage setpoint fall time from the parameter value Nom. voltage [59] (page 33) to 0V.	5,00 s
0,00 s ÷ 3600,00 s		

7.4.4 VOLT. CONTROLLER

Group of parameters number [473]

Output voltage controller. This controller helps to maintain stable output voltage and minimize the effect of filter or transform.

MENU \ SETTINGS \ CONTROL AND REGULATION \ VOLT. CONTROLLER

Name [ID]	Description	Def.
Volt. cont. mode [109]	Voltage controller mode of operation. Selection of the controlled quantity and the feedback.	Turned off
Turned off	Voltage controller is turned off.	
Min(U,V,W)	Voltage feedback is evaluated as the minimum voltage of individual phases. Voltage reference and the feedback are interpreted as phase-to-phase voltages.	
Amp(U,V,W)	Voltage feedback is evaluated as the instantaneous voltage amplitude. Voltage reference and the feedback are interpreted as phase-to-phase voltages.	

Name [ID]	Description	Def.
Avg(U,V,W)	Voltage feedback is evaluated as the average voltage of individual phases. Voltage reference and the feedback are interpreted as phase-to-phase voltages.	
Phase U	Voltage of the first phase (U) is evaluated as the voltage feedback. Voltage reference and the feedback are interpreted as phase-to-neutral voltages.	
Volt. ref. output [927]	Output voltage reference. This value serves as the setpoint for voltage controller.	400,0 V
1,0 V ÷ 1200,0 V		
Volt. ref. ramp [838]	Voltage reference ramp, votlage reference rate of change in V/s.	200,0 V
0,0 V ÷ 10000,0 V		
P term volt. cont. [474]	Proportional gain of the voltage controller.	0,25
0,00 ÷ 1000,00		
I term volt. cont. [476]	Time constant of the integration term of the voltage controller.	5,00 s
0,00 s ÷ 1000,00 s		
D term volt. cont. [1484]	Time constant of the derivation term of voltage controller.	0,000 s
0,000 s ÷ 25,000 s		
Voltage filter [283]	Time constant of the voltage feedback filter.	0,002 s
0,000 s ÷ 3,000 s		
Unbalance volt. filter [1184]	Feedback voltage filter suppressing unbalanced voltages during unbalaced output load. This mode can be used only in Amp(U, V, W) mode of control.	Turned off
Turned off | Turned on		

7.4.5 MAX. CURRENT CONTROLLER (MCC)

Group of parameters number [351]
Maximum current controller parameters (MCC), also called the Current limit.

MENU \ SETTINGS \ CONTROL AND REGULATION \ MAX. CURRENT CONTROLLER (MCC)

Name [ID]	Description	Def.
Max. current controller [352]	Turns on Maximum Current Controller (MCC), which restricts the output current to Max. mot. current [5] (page 47) or Max. regen. current [549] (page 48) by the correction of output frequency. It is possible to turn on MCC operation for motoric, regenerative or both modes of operation. Current limit is used to start large inertial loads or load proportional to the motor speed (pumps, fans, mixers, mills). It can also be used in applications, where motor overload occurs. If the maximum value is lower than Permanent current [24] (page 34), MCC ensures permanent operation of the converter. In the beginning of the operation or near zero frequency, output current can exceed the limit value set by Max. mot. current [5] (page 47) or Max. regen. current [549] (page 48).	turned off
turned off	Inactive maximum current controller.	
Freq. control	MCC is enabled and the output current is restricted to the value Max. mot. current [5] (page 47). Current restriction is achieved by lowering the frequency. This type of regulation is suitable for motors witch a fly-wheel or if the motor load is growing when the rotation speed is growing.	
Volt. control	MCC is enabled and the output current is restricted to the value Max. mot. current [5] (page 47). Restriction is achieved by the output voltage correction, while the frequency remains unchanged. Suitable for artificial networks and single-phase appliances.	
Max. mot. current [5]	Maximal current on the converter output in motoric mode of operation .	5,10 A
0,01 ÷ (I_{NK} x 1,75)[6]	Upper limit of the motor current in the motoric mode of operation. This current is not exceeded, when the maximum current controller (MCC) in motoric mode is turned on. During fast load	

Name [ID]	Description	Def.
	step changes can the current on the converter output shortly exceed this limit, it depends on the load inertia, rate of load and the MCC dynamics [351] (page 47). [6]*The value depends on the inverter power line. See installation manual.*	
Max. regen. current [549]	Maximal current on the converter output in regenerative mode of operation.	5,10 A
0,01 ÷ (I_{NK} x 1,75)[6]	Upper limit of the motor current during the regenerative operation that is restricted, while the maximum current controller (MCC) Max. current controller [352] (page 47) in generator mode is operational. During load step changes can the current on the converter output shortly exceed this limit, it depends on the load inertia, kind of the load and the MCC dynamics. [6]*The value depends on the inverter power line. See installation manual.*	
P term of the MCC [353]	Gain value of the maximum current controller (MCC) proportional term.	2,000
0,000 ÷ 30,000	The higher the P term of MCC value, the bigger the damping and lower the current overshoot caused by load steps and speed changes. On the slow I-term of MCC, lower gain is set and on the faster term higher gain, so the MCC remains stable. When changing this parameter, we advise consulting this step always with the VONSCH s.r.o. service.	
I term of the MCC [354]	Integration time constant value of the maximum current controller(MCC).	0,030 s
0,001 s ÷ 100,000 s	Determines the current regulation dynamics using the MCC. When changing this parameter, we always recoomend consulting this step with the VONSCH s.r.o. service.	

7.4.6 BRAKE MODULE

Group of parameters number [376]
Brake module operation settings parameters.
Brake module (BM) is used for dissipation of excess energy, which is created during the motor regenerative operation or deexcitation of single-phase or other induction loads. Prerequisite activity is the connecting of brake resistor (BR) to BR and + power terminals. Thermal contact of BR can be connected to an binary input as RESET Reset source [704] (page 36) or External fault External fault source [225] (page 80).

MENU \ SETTINGS \ CONTROL AND REGULATION \ BRAKE MODULE

Name [ID]	Description	Def.
Brake module [346]	Turning on the Brake module (BM) operation. BM serves for the energy transfer that flows back during the regenerative operation to the converter. Correct function is conditional to the braking resistor (BR) being connected to the power terminals BR and +.	Turned off
Turned off	Brake module is turned off.	
Turned on	Brake module is turned on and operates if the Braking Resistor (BR) is connected to the converter.	
BM operating voltage [377]	Brake module operation voltage.	685,0 V
Undervoltage[1] ÷ Overvoltage[2]	When the value of this parameter is too high, the risk of the fault " E4-Overvoltage (page 30)"is high. Probability that this fault occurs in the first phase of breaking is higher when a BR of less power rating is used. [1]*Refer to chapter 3.1* Undervoltage, overvoltage *(str. 15) by product type.* [2]*Refer to chapter 3.1* Undervoltage, overvoltage *(str. 15) by product type.*	
BM blocking [1204]	Setting the source of blocking the brake module operation. Thermal contact protects the brake module against damage. This parameter can select binary input BINx, where this contact is connected to, or the output of logical block.	
Look choises of parameter's Bit1 DS mask [553] (page 41)		
BM blocking fault [1205]	Evaluation of BM blocking fault.	Warning
Warning	Warning " W53-BM blocking (page 29)" is evaluated during BM blocking.	
Fault	Fault " E47-BM blocking (page 32)" is evaluated during BM blocking.	

7.4.7 FLUX BRAKING

Group of parameters number [774]
Flux Braking function settings parameters.
Flux braking is used for braking the drive when brake resistor is not connected, or to reinforce and complement other modes of braking [376] (page 48) or dynamic deceleration **Chyba! Nenašiel sa žiaden zdroj odkazov.** (page **Chyba! Záložka nie je definovaná.**).

MENU \ SETTINGS \ CONTROL AND REGULATION \ FLUX BRAKING

Name [ID]	Description	Def.
Flux braking (FB) [775]	Turning on the Flux braking (FB) operation. Flux braking helps to decrease the amount of energy flowing back to the frequency converter by converting a part of the energy to motor heat. When increasing the DC-link voltage beyond the limit of Operating voltage FB [776] (page 49) then the motor excitation (V/f slope or magnetic flux) increases with an intensity proportional to the gain Flux braking gain [777] (page 49). Higher current flows in the motor. Because of this, the drive with this braking mode should be sufficiently temperature resistant or protected.	Turned off
Turned off	Flux braking is turned off.	
Turned on	Flux braking is turned on.	
Operating voltage FB [776]	Flux braking operating voltage.	580,0 V
Undervoltage[1] ÷ Overvoltage[2]	Value of the DC-link voltage, when the flux braking begins to operate. [1]*Refer to chapter 3.1* Undervoltage, overvoltage *(str. 15) by product type.* [2]*Refer to chapter 3.1* Undervoltage, overvoltage *(str. 15) by product type.*	
Flux braking gain [777]	Setting the gain of the flux brake.	0,20
0,00 ÷ 10,00	Too high gain can cause excessive rise of the motor current, up to fault " E11-Overcurrent (page 30)". Flux brake function is inactive when zero value is set. Correct value is selected as a compromise, so that the braking is reliable and the motor current is not unnecessarily high.	
Filter FB [1179]	Time constant of the flux brake filter on the FB output signal.	100 ms
1 ms ÷ 10000 ms	It helps to adjust the flux braking dynamics. In case of slow reactions, it is necessary to increase time constant of the filter and vice versa, when oscillations occur, decrease it.	

7.4.8 POWER RESTRICTION

Group of parameters number [811]
Converter power restriction conditions setting. Power restriction is used for keeping the drive in operation during extreme load or thermal conditions.

MENU \ SETTINGS \ CONTROL AND REGULATION \ POWER RESTRICTION

Name [ID]	Description	Def.
Power restriction (PR) [766]	Selecting the operating mode of the converter power restriction (PR). PR starts decreasing the current restriction and prevents the occurrence of faults that could stop the drive operation. If it is necessary to keep the converter operating even in adverse temperature or load conditions, it is necessary to activate the power restriction mode.	
□ From overload	After exceeding the converter overload Thermal integral INV [31] (page 23) beyond the 90% value, power will be restricted.	
□ From the cooler temperature	After exceeding the temperature Cooler temperature [74] (page 23) beyond the value set by the parameter Cooler temperature warning [767] (page 82), power will be restricted.	
□ From the motor overload	After exceeding the motor overload Thermal integral MT [33] (page 23) beyond the 90% value, power will be restricted.	
□ From external temperature	After exceeding the temperature ETP Temperature [869] (page 22) evaluated from an external temperature sensor, power will be restricted.	

Name [ID]	Description	Def.
□ From the power restriction signal	Converter power restriction after exceeding the parameter value PR Signal [1088] (page 50) beyond the value PR signal limit [1089] (page 50).	
PR Signal [1088]	Selection of the signal, according to which the power will be restricted by an active selection of the power restriction source Power restriction (PR) [766] (page 49) - from the power restriction signal	[472] Freq. INV abs.
Signal		
PR signal limit [1089]	Signal limit PR Signal [1088] (page 50), beyond which the converter restricts the power.	0,00 Hz
0,00 ÷ Max. frequency [111]		
P gain PR [1090]	Gain value of the power restriction (PR) controllers proportional term.	1,0000
-1000,0000 ÷ 1000,0000	PR controller works only when using the PR source active selection from the power restriction signal. If the proportional gain is negative, then regulation error is inverted.	
I gain PR [1091]	Integration time constant value of the power restriction (PR) controllers proportional term.	1,00 s
0,00 s ÷ 1000,00 s	PR controller works only when using the PR source active selection from the power restriction signal.	

7.5 INPUTS AND OUTPUTS

Group of parameters number [216]
Setting of the control, digital and analog inputs and outputs of converter.

7.5.1 BINARY INPUTS

Group of parameters number [143]
Binary (digital) inputs setting.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ BINARY INPUTS

Name [ID]	Description	Def.
BIN HW Type [172]	Binary inputs hardware evaluation setting. The evaluation covers all digital inputs simultaneously.	24V Level
0V Level	Individual binary inputs X1:1, X1:2, X1:3, X1:4, X1:5, X1:6 are active when 0V voltage is connected (Terminal X1:10).	
24V Level	Individual binary inputs X1:1, X1:2, X1:3, X1:4, X1:5, X1:6 are active when 24V voltage is connected (Terminal X1:8).	
BIN1 Filter [178]	Time constant of the binary signal filter.	10 ms
0 ms ÷ 30000 ms	Binary input is switched on when the voltage level defined by parameter BIN HW Type [172] (page 50) is present longer than the value of this parameter and is switched off when the voltage is not present longer than the value of this parameter.	
BIN1 Logic [716]	Determines the binary input evaluation mode. Binary input hardware settings need to be taken into account.	Direct
Direct	If the HW Type is set to 24V, then the BIN is active if there is 24V on the input. If the HW Type is set to 0V, then the BIN is active on 0V.	
Inverted	If the HW Type is set to 24V, then the BIN is active by 0V. If the HW Type is set to 0V, then the BIN is active by 24V.	
BIN2 Filter [179]	Time constant of the binary signal filter.	10 ms
0 ms ÷ 30000 ms	Binary input is switched on when the voltage level defined by parameter BIN HW Type [172] (page 50) is present longer than the value of this parameter and is switched off when the voltage is not present longer than the value of this parameter.	
BIN2 Logic [717]	Determines the binary input evaluation mode. Binary input hardware settings need to be taken into account.	Direct

Name [ID]	Description	Def.
Look choises of parameter's BIN1 Logic [716] (page 50)		
BIN3 Filter [180]	Time constant of the binary signal filter.	10 ms
0 ms ÷ 30000 ms	Binary input is switched on when the voltage level defined by parameter BIN HW Type [172] (page 50) is present longer than the value of this parameter and is switched off when the voltage is not present longer than the value of this parameter.	
BIN3 Logic [718]	Determines the binary input evaluation mode. Binary input hardware settings need to be taken into account.	Direct
Look choises of parameter's BIN1 Logic [716] (page 50)		
BIN4 Filter [181]	Time constant of the binary signal filter.	10 ms
0 ms ÷ 30000 ms	Binary input is switched on when the voltage level defined by parameter BIN HW Type [172] (page 50) is present longer than the value of this parameter and is switched off when the voltage is not present longer than the value of this parameter.	
BIN4 Logic [719]	Determines the binary input evaluation mode. Binary input hardware settings need to be taken into account.	Direct
Look choises of parameter's BIN1 Logic [716] (page 50)		
BIN5 Filter [182]	Time constant of the binary signal filter.	10 ms
0 ms ÷ 30000 ms	Binary input is switched on when the voltage level defined by parameter BIN HW Type [172] (page 50) is present longer than the value of this parameter and is switched off when the voltage is not present longer than the value of this parameter.	
BIN5 Logic [720]	Determines the binary input evaluation mode. Binary input hardware settings need to be taken into account.	Direct
Look choises of parameter's BIN1 Logic [716] (page 50)		
BIN6 Filter [183]	Time constant of the binary signal filter.	10 ms
0 ms ÷ 30000 ms	Binary input is switched on when the voltage level defined by parameter BIN HW Type [172] (page 50) is present longer than the value of this parameter and is switched off when the voltage is not present longer than the value of this parameter.	
BIN6 Logic [721]	Determines the binary input evaluation mode. Binary input hardware settings need to be taken into account.	Direct
Look choises of parameter's BIN1 Logic [716] (page 50)		

7.5.2 ANALOG INPUTS

Group of parameters number [144]
Settings of the analog inputs, which are used for input, setting or continuous measurement of signals like frequency setpoint, pressure, fluid level etc.

AIN1

Group of parameters number [147]
First analog input.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN1

Name [ID]	Description	Def.
AIN1 Type [153]	Analog input type.	0-10V
0-10V	Analog input level corresponds with the voltage, which is measured between the terminals X1:11 and X1:12 in the 0 to 10V(~0 až 100%) DC range.	
2-10V	Analog input level corresponds with the voltage, which is measured between the terminals X1:11 and X1:12 in the 2 to 10V(~0 až 100%) DC range. If this voltage drops under the 2V limit, the	

Name [ID]	Description	Def.
	frequency converter generates the fault " E25-Interrupted AIN1 (page 31)". Fault evaluation can be turned off using AIN Fault [837] (page 80).	
0-20mA	Analog input level corresponds with the current, which is measured between the terminals X1:11 and X1:12 in the 0 to 20mA(~0 až 100%) range.	
4-20mA	Analog input level corresponds with the current, which is measured between the terminals X1:11 and X1:12 in the 4 to 20mA(~0 až 100%) range. If this voltage drops under the 4 mA limit, the frequency converter generates the fault " E25-Interrupted AIN1 (page 31)". Fault evaluation can be turned off using AIN Fault [837] (page 80).	
AIN1 Filter [254]	Time constant of first-order filter of the analog input.	100 ms
0 ms ÷ 30000 ms		

SPECIAL SETTING AIN1

Group of parameters number [150]

Analog input mapping setting for the selected parameter. Value of this parameter will be affected by the analog input value.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN1 \ SPECIAL SETTING AIN1

Name [ID]	Description	Def.
AIN1 Signal [251]	Selection of the signal that will be linearly recalculated according to the analog input.	-
Signal		
Signal (AIN1_A) [253]	Signal value for the analog input level at point A.	-
- ÷ -		
Signal (AIN1_B) [252]	Signal value for the analog input level at point B.	-
- ÷ -		
AIN1_A [949]	Analog input level at point A.	0,00 V
0,00 V ÷ 10,00 V		
AIN1_B [950]	Analog input level at point B.	10,00 V
0,00 V ÷ 10,00 V		

AIN2

Group of parameters number [149]

Second analog input.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN2

Name [ID]	Description	Def.
AIN2 Type [154]	Analog input type.	0-10 V
0-10 V	Analog input value corresponds with the voltage, which is measured between the terminals X1:13 and X1:14 in the 0V to 10V DC range.	
2-10 V	Analog input value corresponds with the voltage, which is measured between the terminals X1:13 and X1:14 in the 2V to 10V DC range. If this voltage drops under the 2V limit, the frequency	

Name [ID]	Description	Def.
	converter generates the fault " E26-Interrupted AIN2 (page 31)". Fault evaluation can be turned off using AIN Fault [837] (page 80).	
0-20 mA	Analog input value corresponds with the current, which is measured between the terminals X1:13 and X1:14 in the 0 to 20mA range.	
4-20 mA	Analog input value corresponds with the current, which is measured between the terminals X1:13 and X1:14 in the 4 to 20mA range. If this voltage drops under the 4 mA limit, the frequency converter generates the fault " E26-Interrupted AIN2 (page 31)". Fault evaluation can be turned off using AIN Fault [837] (page 80).	
AIN2 Filter [262]	Time constant of first-order filter of the analog input.	100 ms
0 ms ÷ 30000 ms		

SPECIAL SETTING AIN2

Group of parameters number [155]

Analog input mapping setting for the selected parameter. Value of this parameter will be affected by the analog input value.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN2 \ SPECIAL SETTING AIN2

Name [ID]	Description	Def.
AIN2 Signal [259]	Selection of the signal that will be linearly recalculated according to the analog input.	-
Signal		
Signal (AIN2_A) [261]	Signal value for the analog input level at point A.	-
- ÷ -		
Signal (AIN2_B) [260]	Signal value for the analog input level at point B.	-
- ÷ -		
AIN2_A [951]	Analog input level at point A.	0,00 V
0,00 V ÷ 10,00 V		
AIN2_B [952]	Analog input level at point B.	10,00 V
0,00 V ÷ 10,00 V		

AIN3

Group of parameters number [148]

Third analog input. Not available for the UNIFREM 400 M converter.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN3

Name [ID]	Description	Def.
AIN3 Type [268]	Analog input type.	0-10 V
0-10 V	Analog input level corresponds with the voltage, which is measured between the terminals X1:15 and X1:16 in the 0 to 10V DC range.	
2-10 V	Analog input level corresponds with the voltage, which is measured between the terminals X1:15 and X1:16 in the 2 to 10V DC range. If this voltage drops under the 2V limit, the frequency	

Name [ID]	Description	Def.
	converter generates the fault " E27-Interrupted AIN3 (page 31)". Fault evaluation can be turned off using AIN Fault [837] (page 80).	
0-20 mA	Analog input level corresponds with the current, which is measured between the terminals X1:15 and X1:16 in the 0 to 20mA range.	
4-20 mA	Analog input level corresponds with the current, which is measured between the terminals X1:15 and X1:16 in the 4 to 20mA range. If this voltage drops under the 4 mA limit, the frequency converter generates the fault " E27-Interrupted AIN3 (page 31)". Fault evaluation can be turned off using AIN Fault [837] (page 80).	
AIN3 Filter [272]	Time constant of first-order filter of the analog input.	100 ms
0 ms ÷ 30000 ms		

SPECIAL SETTING AIN3

Group of parameters number [156]

Analog input mapping setting for the selected parameter. Value of this parameter will be affected by the analog input value.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN3 \ SPECIAL SETTING AIN3

Name [ID]	Description	Def.
AIN3 Signal [269]	Selection of the signal that will be linearly recalculated according to the analog input.	-
Signal		
Signal (AIN3_A) [270]	Signal value for the analog input level at point A.	-
- ÷ -		
Signal (AIN3_B) [271]	Signal value for the analog input level at point B.	-
- ÷ -		
AIN3_A [953]	Analog input level at point A.	0,00 V
0,00 V ÷ 10,00 V		
AIN3_B [954]	Analog input level at point B.	10,00 V
0,00 V ÷ 10,00 V		

AIN4

Group of parameters number [152]

Fourth analog input. Not available for the UNIFREM 400 M converter.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN4

Name [ID]	Description	Def.
AIN4 Type [274]	Analog input type.	0-10 V
0-10 V	Analog input value corresponds with the voltage, which is measured between the terminals X1:17 and X1:18 in the 0 to 10V DC range.	
2-10 V	Analog input value corresponds with the voltage, which is measured between the terminals X1:17 and X1:18 in the 2 to 10V DC range. If this voltage drops under the 2V limit, the frequency	

Name [ID]	Description	Def.
	converter generates the fault " E28-Interrupted AIN4 (page 31)". Fault evaluation can be turned off using AIN Fault [837] (page 80).	
0-20 mA	Analog input value corresponds with the current, which is measured between the terminals X1:17 and X1:18 in the 0 to 20mA range.	
4-20 mA	Analog input value corresponds with the current, which is measured between the terminals X1:17 and X1:18 in the 4 to 20mA range. If this voltage drops under the 4 mA limit, the frequency converter generates the fault " E28-Interrupted AIN4 (page 31)". Fault evaluation can be turned off using AIN Fault [837] (page 80).	
AIN4 Filter [278]	Time constant of first-order filter of the analog input.	100 ms
0 ms ÷ 30000 ms		

SPECIAL SETTING AIN4

Group of parameters number [199]

Analog input mapping setting for the selected parameter. Value of this parameter will be affected by the analog input value.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN4 \ SPECIAL SETTING AIN4

Name [ID]	Description	Def.
AIN4 Signal [275]	Selection of the signal that will be linearly recalculated according to the analog input.	-
Signal		
Signal (AIN4_A) [276]	Signal value for the analog input level at point A.	-
- ÷ -		
Signal (AIN4_B) [277]	Signal value for the analog input level at point B.	-
- ÷ -		
AIN4_A [955]	Analog input level at point A.	0,00 V
0,00 V ÷ 10,00 V		
AIN4_B [956]	Analog input level at point B.	10,00 V
0,00 V ÷ 10,00 V		

7.5.3 RELAY OUTPUTS

Group of parameters number [146]

Relay outputs setting, which can be used for signalization of discrete values and events of the converter, e.g. fault, run, setpoint achieved.

Relay 1

Group of parameters number [186]

Relay 1 setting. Relay is connected to the terminals: NC - X2:25, COM - X2:26, NO - X2:27 (NC - X2:24, COM - X2:25, NO - X2:26 for UNIFREM 400 M).

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ RELAY OUTPUTS \ RELAY 1

Name [ID]	Description	Def.
R1 Source [697]	Relay switching function setting.	Motor operation

Name [ID]	Description	Def.
Motor operation	Relay will switch on when the converter is in start (running).	
Ready	Relay will switch on when the converter is READY.	
Fault	Relay wil switch on when the fault in the converter occurs.	
Brake	Relay will switch on when the mechanical brake function is activated, please see [517] (page 77).	
F=zel	Relay will switch on after reaching the setpoint frequency.	
Special	Relay will switch on after satisfying the conditions in the submenu SPECIAL SETTING.	
R1 switch-on time [307]	The relay switch-on time delay.	0,00 s
0,00 s ÷ 3600,00 s	After establishment of the switch condition, the relay will switch-on after a selected amount of time.	
R1 switch-off time [308]	The relay switch-off time delay.	0,00 s
0,00 s ÷ 3600,00 s	After termination of the switch condition, the relay will switch-off after a selected amount of time.	
R1 Logic [755]	Determines the relay output evaluation mode. The condition will be evaluated first, then the switch times will be evaluated and the relay logic will be evaluated last.	Direct
Direct	If the switch conditions are met, the relay will switch on.	
Inverted	If the switch conditions are met, the relay will switch off.	

SPECIAL SETTING R1

Group of parameters number [221]
Special function setting for relay 1. R1 Source [697] (page 55) must be chosen as "Special".

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ RELAY OUTPUTS \ RELAY 1 \ SPECIAL SETTING R1

Name [ID]	Description	Def.
R1 Signal [189]	Signal that is evaluated for the relay switch. Either numeric or discrete signal can be chosen.	[76] Converter state
Signal		
R1 switch-on [301]	Conditions for R1 switch-on.	Run
Look choises of parameter's Converter state [76] (page 22)		
R1 switch-off [309]	Conditions for R1 switch-off.	
Look choises of parameter's Converter state [76] (page 22)		

Relay 2

Group of parameters number [187]
Relay 2 setting. Relay is connected to the terminals: NC - X2:28, COM - X2:29, NO - X2:30 (NC - X2:21, COM - X2:22, NO - X2:23 for UNIFREM 400 M).

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ RELAY OUTPUTS \ RELAY 2

Name [ID]	Description	Def.
R2 Source [698]	Relay switching function setting. Functionality is the same as RELAY 1 R1 Source [697] (page 55).	Fault
Look choises of parameter's R1 Source [697] (page 55)		
R2 switch-on time [316]	Relay switch-on time delay.	0,00 s
0,00 s ÷ 3600,00 s	After establishment of the switch condition, the relay will switch-on after a selected amount of time.	

Name [ID]	Description	Def.
R2 switch-off time [317]	Relay switch-off time delay.	0,00 s
0,00 s ÷ 3600,00 s	If the switch condition is no longer valid, the relay remains switched on for a selected amount of time.	
R2 Logic [756]	Determines the relay output evaluation mode. The condition will be evaluated first, then the switch times will be evaluated and the relay logic will be evaluated last.	Direct
Direct	If the switch conditions are met, the relay will switch on.	
Inverted	If the switch conditions are met, the relay will switch off.	

SPECIAL SETTING R2

Group of parameters number [223]
Special function setting for relay 2. R2 Source [698] (page 56) must be chosen as "Special".

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ RELAY OUTPUTS \ RELAY 2 \ SPECIAL SETTING R2

Name [ID]	Description	Def.
R2 Signal [311]	Signal that is evaluated for the relay switch. Either numeric or discrete signal can be chosen.	[76] Converter state
Signal		
R2 switch-on [313]	Conditions for R2 switch-on.	Fault
Look choises of parameter's Converter state [76] (page 22)		
R2 switch-off [314]	Conditions for R2 switch-off.	
Look choises of parameter's Converter state [76] (page 22)		

Relay 3

Group of parameters number [188]
Relay 3 setting. Not available for the UNIFREM 400 M VF converter. Relay is connected to the terminals: NC - X2:31, COM - X2:32, NO - X2:33.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ RELAY OUTPUTS \ RELAY 3

Name [ID]	Description	Def.
R3 Source [699]	Relay switching function setting. Functionality is the same as RELAY 1 R1 Source [697] (page 55).	Ready
Look choises of parameter's R1 Source [697] (page 55)		
R3 switch-on time [324]	Relay switch-on time delay.	0,00 s
0,00 s ÷ 3600,00 s	After establishment of the switch condition, the relay will switch-on after a selected amount of time.	
R3 switch-off time [325]	Relay switch-off time delay.	0,00 s
0,00 s ÷ 3600,00 s	If the switch condition is no longer valid, the relay remains switched on for a selected amount of time.	
R3 Logic [757]	Determines the relay output evaluation mode. The condition will be evaluated first, then the switch times will be evaluated and the relay logic will be evaluated last.	Direct
Direct	If the switch conditions are met, the relay will switch on.	
Inverted	If the switch conditions are met, the relay will switch off.	

SPECIAL SETTING R3

Group of parameters number [226]

Special function setting for relay 3. R3 Source [699] (page 57) must be chosen as "Special". Not available for the UNIFREM 400 M converter.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ RELAY OUTPUTS \ RELAY 3 \ SPECIAL SETTING R3

Name [ID]	Description	Def.
R3 Signal [320]	Signal that is evaluated for the relay switch. Either numeric or discrete signal can be chosen.	[76] Converter state
Signal		
R3 switch-on [321]	Conditions for R3 switch-on.	Ready
Look choises of parameter's Converter state [76] (page 22)		
R3 switch-off [322]	Conditions for R3 switch-off.	
Look choises of parameter's Converter state [76] (page 22)		

7.5.4 ANALOG OUTPUTS

Group of parameters number [145]

Analog outputs settings. Analog outputs are used to transfer continuous signals and quantities of the converter to superior control and diagnostic systems such as display units, PLC or measuring instruments.

AO1

Group of parameters number [370]

First analog output is connected to the terminal: Plus - X1:19, Minus - X1:20 (Plus - X1:15, Mínus - X1:16 for UNIFREM 400 M).

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG OUTPUTS \ AO1

Name [ID]	Description	Def.
AO1 Type [358]	Analog output type.	0-20mA
Turned off	Analog output is turned off. The output is 0mA.	
0-20mA	Analog output operates in the 0-20mA range.	
4-20mA	Analog output operates in the 4-20mA range.	
AO1 Source [1076]	Analog output quantity selection.	Freq. INV abs.
Freq. INV abs.	The output value is taken from Freq. INV abs. [472] (page 17).	
MT Current	The output value is taken from Current [42] (page 17).	
Power	The output value is taken from Power [66] (page 17).	
ETP Current	The output value is taken from ETP Current [870] (page 22).	
Torque	The output value is taken from Torque [69] (page 17).	
Special	The output value is taken from Special signal AOx.	
Signal (AO1_A) [360]	Signal value for the analog output level at point A.	0,00 Hz
0,00 ÷ Max. frequency [111]		
Signal (AO1_B) [361]	Signal value for the analog output level at point B.	50,00 Hz
0,00 ÷ Max. frequency [111]		
AO1_A [941]	Analog output level at point A.	0,00 mA
0,00 mA ÷ 20,00 mA		
AO1_B [942]	Analog output level at point B.	20,00 mA
0,00 mA ÷ 20,00 mA		
AO1 Signal [359]	Selection of special signal for the analog output.	[472] Freq. INV abs.
Signal		

AO2

Group of parameters number [371]

Second analog output is connected to the terminal: Plus - X1:21, Minus - X1:22 (Plus - X1:17, Minus - X1:16 for UNIFREM 400 M).

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG OUTPUTS \ AO2

Name [ID]	Description	Def.
AO2 Type [362]	Analog output type. Configuration possibilities are the same as in AO 1 AO1 Type [358] (page 58).	0-20mA
Look choises of parameter's AO1 Type [358] (page 58)		
AO2 Source [1077]	Analog output quantity selection. Configuration possibilities are the same as in AO 1 AO1 Source [1076] (page 58).	MT Current
Look choises of parameter's AO1 Source [1076] (page 58)		
Signal (AO2_A) [366]	Signal value for the analog output level at point A.	0,00 A
0,00 ÷ I_{NK2}[4]	[4]*The value depends on the inverter power line. See installation manual.*	
Signal (AO2_B) [368]	Signal value for the analog output level at point B.	6,00 A
0,00 ÷ I_{NK2}[4]	[4]*The value depends on the inverter power line. See installation manual.*	
AO2_A [945]	Analog output level at point A.	0,00 mA
0,00 mA ÷ 20,00 mA		
AO2_B [946]	Analog output level at point B.	20,00 mA
0,00 mA ÷ 20,00 mA		
AO2 Signal [364]	Selection of the signal that will linearly recalculate the analog output.	[42] Current
Signal		

AO3

Group of parameters number [372]
Third analog output is connected to the terminal: Plus - X1:23, Minus - X1:24. Not available for the UNIFREM 400 M converters.

MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG OUTPUTS \ AO3

Name [ID]	Description	Def.
AO3 Type [363]	Analog output type. Configuration possibilities are the same as in AO 1 AO1 Type [358] (page 58).	0-20mA
Look choises of parameter's AO1 Type [358] (page 58)		
AO3 Source [1078]	Analog output quantity selection. Configuration possibilities are the same as in AO 1 AO1 Source [1076] (page 58).	Power
Look choises of parameter's AO1 Source [1076] (page 58)		
Signal (AO3_A) [367]	Signal value for the analog output level at point A.	0,0 W
-3E9 W ÷ 3E9 W		
Signal (AO3_B) [369]	Signal value for the analog output level at point B.	6000,0 W
-3E9 W ÷ 3E9 W		
AO3_A [947]	Analog output level at point A.	0,00 mA
0,00 mA ÷ 20,00 mA		
AO3_B [948]	Analog output level at point B.	20,00 mA

Name [ID]	Description	Def.
0,00 mA ÷ 20,00 mA		
AO3 Signal [365]	Selection of the signal that will linearly recalculate the analog output.	[66] Power
Signal		

7.6 FUNCTIONS

Group of parameters number [532]
Setting an selection of different optional functions of the UNIFREM frequency converter.

7.6.1 PLC FUNCTIONS

Group of parameters number [315]
Built-in numerical and logical blocks, replacing the need for a simple control system.

LOGICAL BLOCKS

Group of parameters number [166]
Building logical links between the signals. First two logical blocks are fast (they respond in 1ms), other logical blocks respond in 10ms.

LB Timing

Group of parameters number [1024]
LB time delay setting.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ LOGICAL BLOCKS \ LB TIMING

Name [ID]	Description	Def.
On delay 1 [1025]	LB on delay time. It is necessary to select the LB in parameter LB for on delay 1 [1033] (page 60), which this time is designated for.	0,00 s
0,00 s ÷ 7200,00 s		
LB for on delay 1 [1033]	Selecting the logical blocks, which the defined on delay time On delay 1 [1025] (page 60) is applied to.	
Look choises of parameter's Logical blocks [8] (page 20)		
On delay 2 [1026]	LB on delay time. It is necessary to select the LB in parameter LB for on delay 2 [1034] (page 60), which this time is designated for.	0,00 s
0,00 s ÷ 7200,00 s		
LB for on delay 2 [1034]	Selecting the logical blocks, which the defined on delay time On delay 2 [1026] (page 60) is applied to.	
Look choises of parameter's Logical blocks [8] (page 20)		
On delay 3 [1027]	LB on delay time. It is necessary to select the LB in parameter LB for on delay 3 [1035] (page 60), which this time is designated for.	0,00 s
0,00 s ÷ 7200,00 s		
LB for on delay 3 [1035]	Selecting the logical blocks, which the defined on delay time On delay 3 [1027] (page 60) is applied to.	
Look choises of parameter's Logical blocks [8] (page 20)		
On delay 4 [1028]	LB on delay time. It is necessary to select the LB in parameter LB for on delay 4 [1036] (page 60), which this time is designated for.	0,00 s
0,00 s ÷ 7200,00 s		
LB for on delay 4 [1036]	Selecting the logical blocks, which the defined on delay time On delay 4 [1028] (page 60) is applied to.	
Look choises of parameter's Logical blocks [8] (page 20)		
Off delay 1 [1029]	LB off delay time. It is necessary to select the LB in parameter LB for off delay 1	0,00

Name [ID]	Description	Def.
	[1037] (page 61), which this time is designated for.	s
0,00 s ÷ 7200,00 s		
LB for off delay 1 [1037]	Selecting the logical blocks, which the defined off delay time Off delay 1 [1029] (page 60) is applied to.	
Look choises of parameter's Logical blocks [8] (page 20)		
Off delay 2 [1030]	LB off delay time. It is necessary to select the LB in parameter LB for off delay 2 [1038] (page 61), which this time is designated for.	0,00 s
0,00 s ÷ 7200,00 s		
LB for off delay 2 [1038]	Selecting the logical blocks, which the defined off delay time Off delay 2 [1030] (page 61) is applied to.	
Look choises of parameter's Logical blocks [8] (page 20)		
Off delay 3 [1031]	LB off delay time. It is necessary to select the LB in parameter LB for off delay 3 [1039] (page 61), which this time is designated for.	0,00 s
0,00 s ÷ 7200,00 s		
LB for off delay 3 [1039]	Selecting the logical blocks, which the defined off delay time Off delay 3 [1031] (page 61) is applied to.	
Look choises of parameter's Logical blocks [8] (page 20)		
Off delay 4 [1032]	LB off delay time. It is necessary to select the LB in parameter LB for off delay 4 [1040] (page 61), which this time is designated for.	0,00 s
0,00 s ÷ 7200,00 s		
LB for off delay 4 [1040]	Selecting the logical blocks, which the defined off delay time Off delay 4 [1032] (page 61) is applied to.	
Look choises of parameter's Logical blocks [8] (page 20)		

LB Reset

Group of parameters number [1041]
LB reset setting. Selected LB are reseted to the default status.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ LOGICAL BLOCKS \ LB RESET

Name [ID]	Description	Def.
LB Reset [1045]	Selecting the logical blocks for which the reset is applied.	
Look choises of parameter's Logical blocks [8] (page 20)		
LB Reset signal [1042]	Selecting the signal for the LB Reset. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB Reset active [1043]	Conditions for LB reset activation.	-
- ÷ -		
LB Reset inactive [1044]	LB reset deactivation: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		

LB1 (Fast)

Group of parameters number [167]
First quick logical operation setting (1ms reaction time).

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ LOGICAL BLOCKS \ LB1 (FAST)

Name [ID]	Description	Def.
LB1 Operation [625]	Logical operation type that will be used for the logical block.	OR
OR	Disjunction operation. The output is active if at least one of the inputs is active.	

Name [ID]	Description	Def.
AND	Conjunction operation. Output is active if both inputs are active.	
XOR	Exclusive sum operation. Output is active if inputs are different (one active, the other inactive).	
RS	RS flip-flop. Output is set to inactive if the first input is active. Output is set to active if the second input is active.	
=	Operation equals. Output is active if both inputs are identical.	
>=	Operation greater or equal. Output is active if the first signal is greater than or equals the second signal.	
>	Operation greater. Output is active if the first signal is greater than the second signal.	
LB1 Level [1008]	Input and output type of the logical block.	
□ Output negated.	Logical block output will be negated.	
□ Input 1 negated.	First input signal is negated.	
□ Input 2 negated.	Second input signal is negated.	
□ Input 1 edge.	First LB input responds to the leading edge of the signal.	
□ Input 2 edge.	Second LB input responds to the leading edge of the signal.	
LB1_1 Signal [577]	Signal selection for the 1st input of LB1. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB1_1 switch-on [578]	Conditions for switching on the LB1_1.	-
- ÷ -		
LB1_1 switch-off [579]	LB1_1 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		
LB1_2 Signal [580]	Signal selection for the 2nd input of LB1. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB1_2 switch-on [581]	Conditions for switching on the LB2.	-
- ÷ -		
LB1_2 switch-off [582]	LB1_2 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		

LB2 (Fast)

Group of parameters number [168]
Second quick logical operation setting (1ms reaction time).

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ LOGICAL BLOCKS \ LB2 (FAST)

Name [ID]	Description	Def.
LB2 Operation [626]	Logical operation type that will be used for the logical block. Configuration possibilities are the same as in LB 1 LB1 Operation [625] (page 61).	OR
Look choises of parameter's LB1 Operation [625] (page 61)		
LB2 Level [1009]	Input and output type of the logical block. Configuration possibilities are the same as in LB 1 LB1 Level [1008] (page 62).	
Look choises of parameter's LB1 Level [1008] (page 62)		
LB2_1 Signal [583]	Signal selection for the 1st input of LB2. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-

Name [ID]	Description	Def.
Signal		
LB2_1 switch-on [584]	Conditions for switching on the LB2_1.	-
- ÷ -		
LB2_1 switch-off [585]	LB2_1 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		
LB2_2 Signal [586]	Signal selection for the 2nd input of LB2. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB2_2 switch-on [587]	Conditions for switching on the LB2_2.	-
- ÷ -		
LB2_2 switch-off [588]	LB2_2 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		

LB3

Group of parameters number [169]
Third logical operation setting.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ LOGICAL BLOCKS \ LB3

Name [ID]	Description	Def.
LB3 Operation [627]	Logical operation type that will be used for the logical block. Configuration possibilities are the same as in LB 1 LB1 Operation [625] (page 61).	OR
Look choises of parameter's LB1 Operation [625] (page 61)		
LB3 Level [1010]	Input and output type of the logical block. Configuration possibilities are the same as in LB 1 LB1 Level [1008] (page 62).	
Look choises of parameter's LB1 Level [1008] (page 62)		
LB3_1 Signal [589]	Signal selection for the 1st input of LB3. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB3_1 switch-on [590]	Conditions for switching on the LB3_1.	-
- ÷ -		
LB3_1 switch-off [591]	LB3_1 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		
LB3_2 Signal [592]	Signal selection for the 2nd input of LB3. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB3_2 switch-on [593]	Conditions for switching on the LB3_2.	-
- ÷ -		
LB3_2 switch-off [594]	LB3_2 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		

LB4

Group of parameters number [170]
Fourth logical operation setting.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ LOGICAL BLOCKS \ LB4

Name [ID]	Description	Def.
LB4 Operation [628]	Logical operation type that will be used for the logical block. Configuration possibilities are the same as in LB 1 LB1 Operation [625] (page 61).	OR
Look choises of parameter's LB1 Operation [625] (page 61)		
LB4 Level [1011]	Input and output type of the logical block. Configuration possibilities are the same as in LB 1 LB1 Level [1008] (page 62).	
Look choises of parameter's LB1 Level [1008] (page 62)		
LB4_1 Signal [595]	Signal selection for the 1st input of LB4. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB4_1 switch-on [596]	Conditions for switching on the LB4_1.	-
- ÷ -		
LB4_1 switch-off [597]	LB4_1 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		
LB4_2 Signal [598]	Signal selection for the 2nd input of LB4. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB4_2 switch-on [599]	Conditions for switching on the LB4_2.	-
- ÷ -		
LB4_2 switch-off [600]	LB4_2 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		

LB5

Group of parameters number [171]
Fifth logical operation setting.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ LOGICAL BLOCKS \ LB5

Name [ID]	Description	Def.
LB5 Operation [629]	Logical operation type that will be used for the logical block. Configuration possibilities are the same as in LB 1 LB1 Operation [625] (page 61).	OR
Look choises of parameter's LB1 Operation [625] (page 61)		
LB5 Level [1012]	Input and output type of the logical block. Configuration possibilities are the same as in LB 1 LB1 Level [1008] (page 62).	
Look choises of parameter's LB1 Level [1008] (page 62)		
LB5_1 Signal [601]	Signal selection for the 1st input of LB5. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB5_1 switch-on [602]	Conditions for switching on the LB5_1.	-
- ÷ -		
LB5_1 switch-off [603]	LB5_1 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		
LB5_2 Signal [604]	Signal selection for the 2nd input of LB5. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		

Name [ID]	Description	Def.
LB5_2 switch-on [605]	Conditions for switching on the LB5_2.	-
- ÷ -		
LB5_2 switch-off [606]	LB5_2 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		

LB6

Group of parameters number [173]
Sixth logical operation setting.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ LOGICAL BLOCKS \ LB6

Name [ID]	Description	Def.
LB6 Operation [630]	Logical operation type that will be used for the logical block. Configuration possibilities are the same as in LB 1 LB1 Operation [625] (page 61).	OR
Look choises of parameter's LB1 Operation [625] (page 61)		
LB6 Level [1013]	Input and output type of the logical block. Configuration possibilities are the same as in LB 1 LB1 Level [1008] (page 62).	
Look choises of parameter's LB1 Level [1008] (page 62)		
LB6_1 Signal [607]	Signal selection for the 1st input of LB6. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB6_1 switch-on [608]	Conditions for switching on the LB6_1.	-
- ÷ -		
LB6_1 switch-off [609]	LB6_1 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		
LB6_2 Signal [610]	Signal selection for the 2nd input of LB6. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB6_2 switch-on [611]	Conditions for switching on the LB6_2.	-
- ÷ -		
LB6_2 switch-off [612]	LB6_2 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		

LB7

Group of parameters number [174]
Seventh logical operation setting.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ LOGICAL BLOCKS \ LB7

Name [ID]	Description	Def.
LB7 Operation [631]	Logical operation type that will be used for the logical block. Configuration possibilities are the same as in LB 1 LB1 Operation [625] (page 61).	OR
Look choises of parameter's LB1 Operation [625] (page 61)		
LB7 Level [1014]	Input and output type of the logical block. Configuration possibilities are the same as in LB 1 LB1 Level [1008] (page 62).	
Look choises of parameter's LB1 Level [1008] (page 62)		
LB7_1 Signal	Signal selection for the 1st input of LB7. It will be processed according to the selected	-

Name [ID]	Description	Def.
[613]	operation. Either numeric or discrete signal can be chosen.	
Signal		
LB7_1 switch-on [614]	Conditions for switching on the LB7_1.	-
- ÷ -		
LB7_1 switch-off [615]	LB7_1 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		
LB7_2 Signal [616]	Signal selection for the 2nd input of LB7. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB7_2 switch-on [617]	Conditions for switching on the LB7_2.	-
- ÷ -		
LB7_2 switch-off [618]	LB7_2 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		

LB8

Group of parameters number [175]
Eight logical operation setting.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ LOGICAL BLOCKS \ LB8

Name [ID]	Description	Def.
LB8 Operation [632]	Logical operation type that will be used for the logical block. Configuration possibilities are the same as in LB 1 LB1 Operation [625] (page 61).	OR
Look choises of parameter's LB1 Operation [625] (page 61)		
LB8 Level [1015]	Input and output type of the logical block. Configuration possibilities are the same as in LB 1 LB1 Level [1008] (page 62).	
Look choises of parameter's LB1 Level [1008] (page 62)		
LB8_1 Signal [619]	Signal selection for the 1st input of LB8. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB8_1 switch-on [620]	Conditions for switching on the LB8_1.	-
- ÷ -		
LB8_1 switch-off [621]	LB8_1 switching off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		
LB8_2 Signal [622]	Signal selection for the 2nd input of LB8. It will be processed according to the selected operation. Either numeric or discrete signal can be chosen.	-
Signal		
LB8_2 switch-on [623]	Conditions for switching on the LB8_2.	-
- ÷ -		
LB8_2 switch-off [624]	LB8_2 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		

NUMERICAL BLOCKS

Group of parameters number [176]
Creating computational links among signals. They react with a delay of 10 ms.

NB1

Group of parameters number [191]
Settings of the first numerical block.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ NUMERICAL BLOCKS \ NB1

Name [ID]	Description	Def.
NB1 input 1 [633]	Selection of signal for the 1st input of NB1. This signal will be processed according the selected operation.	-
Signal		
NB1 input 2 [634]	Selection of signal for the 2nd input of NB1. This signal will be processed according the selected operation.	-
Signal		
NB1 operation [635]	Type of operation used for the numerical block.	plus
plus	NB output is calculated as the sum of input signals.	
minus	NB output is calculated as the difference of input signals.	
multiply	NB output is calculated as the product of input signals.	
minimum	NB output is the minimum of input signals.	
maximum	NB output is the maximum of input signals.	
abs	NB output is the absolute value of the first input signal.	
filter	First input signal is filtered by low pass first-order filter, time constant of this filter is given by the second input value.	
multiplexer	NB output is one of the input signals. If the control signal is inactive, value of the first input will be used. If the control signal is active, value of the second input will be used.	
integrator	NB output is the integral value of the first input signal. Second input signal is used as gain value. NB output is saturated according to Output (NBx_A) and Output (NBx_B) values.	
NB1 control [1279]	This parameter serves for control of numerical block. It serves as a input selector for multiplexer operation. It serves as an enable input for other operations, the operation is performed if enabled, otherwise the previous output sample is used.	Active
Look choises of parameter's Bit1 DS mask [553] (page 41)		
NB1 output [1254]	Selection of output parameter, to be written to by numerical blok, according to the linear characteristic set by points A, B.	-
Signal		
NB1_A [1257]	Result of the operation of numerical block at point A.	0,000000000000
-1E18 ÷ 1E18		
Output (NB1_A) [1255]	The output value corresponding to NB1_A [1257] (page 67).	-
- ÷ -		
NB1_B [1258]	Result of the operation of numerical block at point B.	100,000000000000
-1E18 ÷ 1E18		
Output (NB1_B) [1256]	The output value corresponding to NB1_B [1258] (page 67).	-
- ÷ -		

NB2

Group of parameters number [300]
Settings of the second numerical block.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ NUMERICAL BLOCKS \ NB2

Name [ID]	Description	Def.
NB2 input 1 [637]	Selection of signal for the 1st input of NB2. This signal will be processed according the selected operation.	-
Signal		
NB2 input 2 [638]	Selection of signal for the 2nd input of NB2. This signal will be processed according the selected operation.	-
Signal		
NB2 operation [639]	Type of operation used for the numerical block.	plus
Look choises of parameter's NB1 operation [635] (page 67)		
NB2 control [1280]	See NB1 control [1279] (page 67).	Active
Look choises of parameter's Bit1 DS mask [553] (page 41)		
NB2 output [1259]	Selection of output parameter, to be written to by numerical blok, according to the linear characteristic set by points A, B.	-
Signal		
NB2_A [1262]	Result of the operation of numerical block at point A.	0,000000000000
-1E18 ÷ 1E18		
Output (NB2_A) [1260]	The output value corresponding to NB2_A [1262] (page 68).	-
- ÷ -		
NB2_B [1263]	Result of the operation of numerical block at point B.	100,000000000000
-1E18 ÷ 1E18		
Output (NB2_B) [1261]	The output value corresponding to NB2_B [1263] (page 68).	-
- ÷ -		

NB3

Group of parameters number [302]
Settings of the third numerical block.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ NUMERICAL BLOCKS \ NB3

Name [ID]	Description	Def.
NB3 input 1 [1016]	Selection of signal for the 1st input of NB3. This signal will be processed according the selected operation.	-
Signal		
NB3 input 2 [1017]	Selection of signal for the 2nd input of NB3. This signal will be processed according the selected operation.	-
Signal		
NB3 operation [1018]	Type of operation used for the numerical block.	plus
Look choises of parameter's NB1 operation [635] (page 67)		
NB3 control [1281]	See NB1 control [1279] (page 67).	Active
Look choises of parameter's Bit1 DS mask [553] (page 41)		
NB3 output	Selection of output parameter, to be written to by numerical blok,	-

Name [ID]	Description	Def.
[1264]	according to the linear characteristic set by points A, B.	
Signal		
NB3_A [1267]	Result of the operation of numerical block at point A.	0,000000000000
-1E18 ÷ 1E18		
Output (NB3_A) [1265]	The output value corresponding to NB3_A [1267] (page 69).	-
- ÷ -		
NB3_B [1268]	Result of the operation of numerical block at point B.	100,000000000000
-1E18 ÷ 1E18		
Output (NB3_B) [1266]	The output value corresponding to NB3_B [1268] (page 69).	-
- ÷ -		

NB4

Group of parameters number [310]
Settings of the fourth numerical block.

MENU \ SETTINGS \ FUNCTIONS \ PLC FUNCTIONS \ NUMERICAL BLOCKS \ NB4

Name [ID]	Description	Def.
NB4 input 1 [1020]	Selection of signal for the 1st input of NB4. This signal will be processed according the selected operation.	-
Signal		
NB4 input 2 [1021]	Selection of signal for the 2nd input of NB4. This signal will be processed according the selected operation.	-
Signal		
NB4 operation [1022]	Type of operation used for the numerical block.	plus
Look choises of parameter's NB1 operation [635] (page 67)		
NB4 control [1282]	See NB1 control [1279] (page 67).	Active
Look choises of parameter's Bit1 DS mask [553] (page 41)		
NB4 output [1269]	Selection of output parameter, to be written to by numerical blok, according to the linear characteristic set by points A, B.	-
Signal		
NB4_A [1272]	Result of the operation of numerical block at point A.	0,000000000000
-1E18 ÷ 1E18		
Output (NB4_A) [1270]	The output value corresponding to NB4_A [1272] (page 69).	-
- ÷ -		
NB4_B [1273]	Result of the operation of numerical block at point B.	100,000000000000
-1E18 ÷ 1E18		
Output (NB4_B) [1271]	The output value corresponding to NB4_B [1273] (page 69).	-
- ÷ -		
Data 1 [636]	Custom parameter.	1,000000000000
-1E18 ÷ 1E18	Used to store parameters and intermediate results of numerical and logical blocks.	
Data 2 [640]	Custom parameter.	1,000000000000
-1E18 ÷ 1E18	Used to store parameters and intermediate results of numerical and logical blocks.	
Data 3 [1019]	Custom parameter.	1,000000000000
-1E18 ÷ 1E18	Used to store parameters and intermediate results of numerical and logical blocks.	

Name [ID]	Description	Def.
Data 4 [1023]	Custom parameter.	1,000000000000
-1E18 ÷ 1E18	Used to store parameters and intermediate results of numerical and logical blocks.	
Data hex 5 [334]	Custom parameter. Number is set in hexadecimal base.	0000 hex
0000 hex ÷ FFFFFFFF hex	Used to store parameters and intermediate results of numerical and logical blocks.	
Data hex 6 [467]	Custom parameter. Number is set in hexadecimal base.	0000 hex
0000 hex ÷ FFFFFFFF hex	Used to store parameters and intermediate results of numerical and logical blocks.	

7.6.2 LIMIT SWITCHES

Group of parameters number [875]
Limit switch setting. Setting the limit switches that are used to derive the various control commands (STOP or decelerate) after the specific events.

LS1

Group of parameters number [876]
First limit switch setting

MENU \ SETTINGS \ FUNCTIONS \ LIMIT SWITCHES \ LS1

Name [ID]	Description	Def.
LS1 Type [880]	Limit switch type setting	
□ Slowing	After the switch-on of the LS, the converter reduces the frequency to LSx frequency.	
□ Track + Stop	After the switch-on of the LS, motor will run the track (LSx Track) in the given direction and then stops.	
□ Stop	After the switch-on of the LS, motor stops in the given direction.	
□ For reverse	Limit switch responds in the reverse direction only.	
LS1 Frequency [915]	Maximum frequency restriction value when activation the limit switch function set to the "Decelerating" type. Decelerating function will be applied only for the given rotation direction according to the limit switch type.	0,00 Hz
Min. frequency [110] ÷ Max. frequency [111]		
LS1 Track [884]	Range track that the converter allows to pass when activating the limit switch function set to the Track + Stop type. Both parameters Transmission ratio [888] (page 33) and Wheel circumference [889] (page 33) need to be set.	0,0000 m
0,0000 m ÷ 99000,0000 m		
LS1 Source [895]	Limit switch source setting	None
Look choises of parameter's Quick stop source. [986] (page 36)		
LS1 Mask [896]	The limit switch command will be active if at least one of the selected binary inputs or logical blocks will be active.	
Look choises of parameter's Bit1 DS mask [553] (page 41)		

LS2

Group of parameters number [877]
Second limit switch setting

MENU \ SETTINGS \ FUNCTIONS \ LIMIT SWITCHES \ LS2

Name [ID]	Description	Def.
LS2 Type [881]	Limit switch type setting. Configuration possibilities are the same as in LS1 LS1 Type [880] (page 70).	

Name [ID]	Description	Def.
Look choises of parameter's LS1 Type [880] (page 70)		
LS2 Frequency [916]	Maximum frequency restriction value when activation the limit switch function set to the "Decelerating" type. Decelerating function will be applied only for the given rotation direction according to the limit switch type.	0,00 Hz
Min. frequency [110] ÷ Max. frequency [111]		
LS2 Track [885]	Range track that the converter allows to pass when activating the limit switch function set to the Track + Stop type. Both parameters Transmission ratio [888] (page 33) and Wheel circumference [889] (page 33) need to be set.	0,0000 m
0,0000 m ÷ 99000,0000 m		
LS2 Source [898]	Limit switch source setting	None
Look choises of parameter's Quick stop source. [986] (page 36)		
LS2 Mask [899]	The limit switch command will be active if at least one of the selected binary inputs or logical blocks will be active.	
Look choises of parameter's Bit1 DS mask [553] (page 41)		

LS3

Group of parameters number [878]
Third limit switch setting

MENU \ SETTINGS \ FUNCTIONS \ LIMIT SWITCHES \ LS3

Name [ID]	Description	Def.
LS3 Type [882]	Limit switch type setting. Configuration possibilities are the same as in LS1 LS1 Type [880] (page 70).	
Look choises of parameter's LS1 Type [880] (page 70)		
LS3 Frequency [917]	Maximum frequency restriction value when activation the limit switch function set to the "Decelerating" type. Decelerating function will be applied only for the given rotation direction according to the limit switch type.	0,00 Hz
Min. frequency [110] ÷ Max. frequency [111]		
LS3 Track [886]	Range track that the converter allows to pass when activating the limit switch function set to the Track + Stop type. Both parameters Transmission ratio [888] (page 33) and Wheel circumference [889] (page 33) need to be set.	0,0000 m
0,0000 m ÷ 99000,0000 m		
LS3 Source [901]	Limit switch source setting	None
Look choises of parameter's Quick stop source. [986] (page 36)		
LS3 Mask [902]	The limit switch command will be active if at least one of the selected binary inputs or logical blocks will be active.	
Look choises of parameter's Bit1 DS mask [553] (page 41)		

LS4

Group of parameters number [879]
Fourth limit switch setting

MENU \ SETTINGS \ FUNCTIONS \ LIMIT SWITCHES \ LS4

Name [ID]	Description	Def.
KS4 Type [883]	Limit switch type setting. Configuration possibilities are the same as in LS1	

Name [ID]	Description	Def.
	LS1 Type [880] (page 70).	
Look choises of parameter's LS1 Type [880] (page 70)		
LS4 Frequency [918]	Maximum frequency restriction value when activation the limit switch function set to the "Decelerating" type. Decelerating function will be applied only for the given rotation direction according to the limit switch type.	0,00 Hz
Min. frequency [110] ÷ Max. frequency [111]		
LS4 Track [887]	Range track that the converter allows to pass when activating the limit switch function set to the Track + Stop type. Both parameters Transmission ratio [888] (page 33) and Wheel circumference [889] (page 33) need to be set.	0,0000 m
0,0000 m ÷ 99000,0000 m		
LS4 Source [904]	Limit switch source setting	None
Look choises of parameter's Quick stop source. [986] (page 36)		
LS4 Mask [905]	The limit switch command will be active if at least one of the selected binary inputs or logical blocks will be active.	
Look choises of parameter's Bit1 DS mask [553] (page 41)		

7.6.3 PROCESS CONTROLLER

Group of parameters number [385]

General process controller is intended for additional control of the selected quantity. Controlled quantity is selected using the signal specified by PC feedback source [139] (page 73) and its setpoint by Source of PC setpoint [130] (page 73). Output PC [64] (page 21) is then used as a source of a parameter of output type SIGNAL (e.g. frequency or torque setpoint).

MENU \ SETTINGS \ FUNCTIONS \ PROCESS CONTROLLER

Name [ID]	Description	Def.
PC Mode [386]	Selection of process controller mode and physical dimension of the output.	Turned off
Turned off	Process controller is turned off.	
Pressure Pa	Controlled quantity is the pressure in Pascal [Pa].	
Pressure Pa inverted	Controlled quantity is the pressure in Pascal [Pa], error is inverted.	
Pressure bar	Controlled quantity is the pressure in bar [bar].	
Pressure bar inverted	Controlled quantity is the pressure in bar [bar], error is inverted.	
Pressure atm	Controlled quantity is the pressure in atmosphere [atm].	
Pressure at inverted	Controlled quantity is the pressure in atmosphere [atm], error is inverted.	
Temperature	Controlled quantity is the temperature in degree Celsius [°C].	
Temperature inverted	Controlled quantity is the temperature in degree Celsius [°C], error is inverted.	
Position	Controlled quantity is the position.	
Position inverted	Controlled quantity is the position, error is inverted.	
Flow	Controlled quantity is the flow.	
Flow inverted	Controlled quantity is the flow, error is inverted.	
Relative	Controlled quantity is in relative units.	
Relative inverted	Controlled quantity is in relative units, error is inverted.	
Voltage	Controlled quantity is the voltage.	
Voltage inverted	Controlled quantity is the voltage, error is inverted.	
Current	Controlled quantity is the current.	
Current inverted	Controlled quantity is the current, error is inverted.	

Name [ID]	Description	Def.
Power	Controlled quantity is the power.	
Power inverted	Controlled quantity is the power, error is inverted.	
Source of PC setpoint [130]	Selecting the setpoint value of the process controller.	Value
Value	Parameter Source of PC setpoint [130] (page 73) will be used as the setpoint source.	
AIN1	Analog input AIN1 will be used as the PC Setpoint value source.	
AIN2	Analog input AIN2 will be used as the PC Setpoint value source.	
AIN3	Analog input AIN3 will be used as the PC Setpoint value source.	
AIN4	Analog input AIN4 will be used as the PC Setpoint value source.	
Up/down commands	The up/down commands will be used as the setpoint source, please see [970] (page 42).	
Special	The special setting Setpoint signal [419] (page 74) will be used as the source.	
Setpoint value [407]	Process controller setpoint value. Value applies if the parameter Source of PC setpoint [130] (page 73) is set to "Value".	0,0 %
FB lower limit [396] ÷ FB upper limit [397]		
PC feedback source [139]	Process controller feedback source setting. Feedback represents the actual value of controlled quantity. It is usually a signal from the sensor or measurement converter.	Value
Look choises of parameter's Source of PC setpoint [130] (page 73)		
Feedback [418]	Process controller feedback value. Value applies if no signal is chosen PC feedback source [139] (page 73).	0,0 %
FB lower limit [396] ÷ FB upper limit [397]		
FB lower limit [396]	Minimal value of the regulation (feedback) range.	0,0 %
-500,0 % ÷ 500,0 %		
FB upper limit [397]	Maximal value of the regulation (feedback) range.	0,0 %
-500,0 % ÷ 500,0 %		
Dead-zone [406]	Process controller dead-zone(insensitivity) for small changes of the error value.	0,0 %
-500,0 % ÷ 500,0 %	Setting a non-zero dead-zone can suppress the oscillations at the PC output caused by noise at the control error Error PC [410] (page 21), but can also cause steady-state error, which is proportional to the value of dead-zone.	
Proportional term P [411]	Proportional gain of the process controller.	1,00
0,00 ÷ 30,00		
Integration term I [412]	Time constant of the integration term of the process controller.	10,00 s
0,01 s ÷ 600,01 s	Integration term is turned off, if the value is set to 0 s.	
Derivation term D [413]	Time constant of the derivation term of process controller.	0,00 s
0,00 s ÷ 1,00 s		
D term filter [17]	Filter time constant of the derivation term of the process controller.	0,0 ms
0,0 ms ÷ 1000,0 ms	Filter is bypassed, when the value is set to 0 s.	
Parking [414]	Parking is a function, which automatically deactivates the START, if the parking conditions Depark. hyst. [416] (page 74) and Parking time [415] (page 74) are	Turned off

Name [ID]	Description	Def.
	met. If the PC operates at its low limit for the time Parking time [415] (page 74), converter blocks the START. This can occur if the controlled quantity exceeds the setpoint value and the PC output is at minimum. If the regulation error changes so it exceeds the value Depark. hyst. [416] (page 74), the START block will be undone and PC starts to regulate. This function is used to prevent unnecessary operation of the device and saving the energy when the regulation has no major impact on the controlled quantity.	
Turned off	Parking is turned off.	
Turned on	Parking is turned on.	
Depark. hyst. [416]	The value the regulation error, when parking of the converter is canceled (parking = disabling the Start block).	0,0 %
-500,0 % ÷ 500,0 %		
Parking time [415]	Time that has to pass, when the parking conditions are met, to park the PC (parking = blocking the Start).	60,0 s
0,1 s ÷ 3200,0 s		

PC Initialization

Group of parameters number [1132]
Setting the initialization (reset) signal of the PC output and the I-term to the defined value.

MENU \ SETTINGS \ FUNCTIONS \ PROCESS CONTROLLER \ PC INITIALIZATION

Name [ID]	Description	Def.
PC Reset signal [303]	Process controller reset signal.	-
Signal	After activating the process controller reset signal, the integration term and the PC output are set to value given by the parameter PC Reset value [1131] (page 74).	
PC Reset [305]	Conditions for PC reset.	-
- ÷ -		
PC Reset ianctive [779]	Deactivation of PC reset: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		
PC Reset value [1131]	Value that is set by the converter to the output and the PC integration term after an active PC reset.	0,0000
-1,0000 ÷ 1,0000		

SPECIAL SETTING PC

Group of parameters number [196]
Special setting of the process controller signals.

MENU \ SETTINGS \ FUNCTIONS \ PROCESS CONTROLLER \ SPECIAL SETTING PC

Name [ID]	Description	Def.
Setpoint signal [419]	Selection of the parameter that represents the setpoint value of the process controller. The value is applied if the parameter Source of PC setpoint [130] (page 73) is set to "Special".	-
Signal	Selected parameter is automatically recalculated to the range of regulation of the process controller.	
Feedback signal [408]	Selection of the parameter that represents the feedback value of the process controller.	-
Signal	Selected parameter is automatically recalculated to the given range.	

7.6.4 OPTIMIZATION

Group of parameters number [65]

Setting the parameters for the optimization block that is used to search for the extremum of any signal using the change of a selected setpoint signal, which are connected to optimization output OPT Output [423] (page 21).

Optimization searches for an output value, at which it reaches the criteria of the selected signal. If the measuring conditions Opt. meas. signal [279] (page 76) and the operation condition Opt. reset signal [263] (page 76) during the optimization are met, new output samples are calculated in defined intervals Optimization step [742] (page 21). The found global extremum is saved to the memory.

START. POINT OPT

Group of parameters number [711]

Defines the initial conditions (starting point) of the optimization, when the scanning is turned off.

MENU \ SETTINGS \ FUNCTIONS \ OPTIMIZATION \ START. POINT OPT

Name [ID]	Description	Def.
Start. Point OPT [710]	Defines the starting value of the optimization output, when the scanning is turned off.	0,5000
0,0000 ÷ 1,0000	If the OPTSP source Start. point source [712] (page 75) is not selected, this fixed value will be used.	
Start. point source [712]	Selection of a signal that can be used as an optimization starting point, when the starting point storing condition is met.	-
Signal		
Start. point condition [713]	Signal that is evaluated, if a starting point from the selected signal should be set or not.	[709] OPT State
Signal	For example, parameter Status word negated [547] (page 22) is selected and in OPTSP active [714] (page 75) "Run" is selected, the starting value from Start. point source [712] (page 75) will be stored, when the converter is not in START mode. When in START, the last saved starting value is kept.	
OPTSP active [714]	Conditions for activation of starting point of optimization.	Measuring
Look choises of parameter's OPT State [709] (page 21)		
OPTSP inactive [715]	OPTSP inactive: In case of a numeric signal if the signal value is lower than the defined level.	
Look choises of parameter's OPT State [709] (page 21)		
Opt. signal [80]	Selection of a parameter, whose value should be optimized according to the criteria Opt. criteria [208] (page 75).	-
Signal	Most often, the optimization signal is selected as Produced or Consumed converter load (MPPT algorithm - maximum power point tracking). Optimized signal can be externally supplied via the analog inputs or derived from any other diagnostic quantity of the frequency converter.	
Opt. criteria [208]	Setting the optimization criteria. For example: on the load that consumes energy the minimum power criteria is selected; on the generators maximum or power factor of the produced power.	Signal min.
Signal min.	Optimization to the minimal value of a selected signal Opt. signal [80] (page 75).	
Signal max.	Optimization to the maximum value of a selected signal Opt. signal [80] (page 75).	
delta signal [255]	Difference between the found global extremum and the optimized quantity, when the optimization is restarted.	-
- ÷ -	Global extremum can be overwritten with a new value after the initial scan, if a new value is found that matches the optimization criteria better. If the algorithm moves away from the found global extremum more that it is set in this parameter, an optimization restart will be generated,	

Name [ID]	Description	Def.
	or eventually a new scan.	
Opt. period [13]	Minimum time between two optimization steps.	2,0 s
0,1 s ÷ 3000,0 s	Time needed to fulfil the measurement condition is added to this time, the condition can be ramp settling or any other event selected by the parameter Opt. meas. signal [279] (page 76).	
Scanning [420]	Full output range scan mode. After START command or optimization reset, converter scans the full range of output OPT Output [423] (page 21) in the direction set by Start. direction [426] (page 76) in order to find new global extremum. Scanning is needed in systems where there are several local extrems and the highest one has to be found. Scan is a gradual search of the whole output range and finding the area of the global extremum. Scan step is 5% of the output signal.	Turned off
Turned off	Scanning is turned off.	
Turned on	Scanning is turned on.	
Step mode [425]	Setting the mode of optimization step calculation during the fine tuning. After starting the converter and scanning the fine optimization starts, slowly changes the output OPT Output [423] (page 21) by small fluctuations of preset step Optimization step [742] (page 21) to maintain the global extremum. Method of calculating the optimization step during the soft adjustment of the extremum.	Fixed
Fixed	Search with a constant output signal step, which is set by the parameter Min. step [427] (page 76).	
Variable	Search with a variable output signal step that is increased proportionally to the derivation of the optimized signal from the value Min. step [427] (page 76) to 5% of the output range and proportionally to the gain Adapt. step gain [743] (page 76).	
Adapt. step gain [743]	Gain of the optimization adaptivity step algorithm from the optimized signal derivative value.	0,800
0,001 ÷ 100,000	Only applies to the variable optimization step in Step mode [425] (page 76).	
Min. step [427]	Minimal optimization step.	0,001
0,001 ÷ 0,050	Optimization step is the difference between two consecutive optimization output samples.	
Start. direction [426]	Direction of the first search. Depending on the technology and specific deployment, is is suitable to search from up to bottom or vice versa. Initial direction is also applied during the Scan process, if turned on.	From minimum
From minimum	Optimization begins from the minimal output value.	
From maximum	Optimization begins from the maximal output value.	
Opt. reset signal [263]	Signal defining the condition of optimization reset.	-
Signal	This signal is used as an optimization operation condition. Is usually set as a special combination of bits (flags) of the status or control word.	
Opt. reset [273]	Conditions for optimization Reset.	-
- ÷ -		
Opt. reset inactive [530]	Optimization reset deactivation: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		
Opt. meas. signal [279]	Selection of a signal that is used to allow the measurement and the next optimization step.	-

Name [ID]	Description	Def.
Signal	Allows to set the conditions, under which the Optimization signal (Opt. signal [80] (page 75)) is stable and not burdened with different errors.	
Opt. meas. active [160]	Measurement of the next optimization step occurs after satisfying the selected condition.	-
- ÷ -		
Opt. meas. inactive [531]	Optimization measurement deactivation: In case of a numeric signal if the signal value is lower than the defined level.	-
- ÷ -		

7.6.5 MECHANICAL BRAKE

Group of parameters number [517]
Parameters for activation and operation conditions of motor mechanical brake.

MENU \ SETTINGS \ FUNCTIONS \ MECHANICAL BRAKE

Name [ID]	Description	Def.
Mechanical brake [518]	Turning on the control of the motor mechanical brake. It may have an influence on the frequency setpoint value and on command generation for the brake control Converter state [76] (page 22), bit "Mech. brake". For correct operation of the mechanical brake, it is necessary to choose the "Brake" in relay settings.	Turned off
Turned off	Mechanical brake control is turned off.	
Standard	Mechanical brake control is turned on.	
Lift	Control of the mechanical brake for lift drives is turned on.	
Brake delay [519]	Delay for the RELAY Brake switch command after the START command.	0,01 s
0,01 s ÷ 100,00 s	From experience, it is set to 0s, because the brake itself and its contactor have their delays.	
Brake reaction [520]	Brake reaction time after the RELAY switch.	0,20 s
0,01 s ÷ 100,00 s	Equals the brake reaction time from the control relay switch to the actual mechanical release. If this time is set to a shorter than the real time, torque current saturation can occur during the start and after the brake release, recoils and mechanical bumps to the system can occur.	
Brake advance [521]	Advance time of the RELAY brake switch-off after reaching the frequency Brake frequency [522] (page 77) in STOP before turning the motor off.	0,20 s
0,01 s ÷ 100,00 s	By setting this parameter, it is possible to eliminate the time until the mechanical brake safely stops the drive to prevent unwanted rotation of the shaft during the drive stop.	
Brake frequency [522]	Frequency, below which the brake is active.	2,0 Hz
0,0 ÷ Nom. frequency [4]	Helps to achieve enough starting torque during the brake release, mainly in the V/f control. In a closed operation mode and a vector operating mode, it is recommended to set it to 0.0Hz.	

7.6.6 EXTERNAL THERMAL PROTECTION (ETP)

Group of parameters number [860]
Setting the external thermal protection (ETP) evaluation block. Sensor type selection (PT100, PTC, Custom). External temperature faults and warnings configuration. For proper operation of ETP, it is necessary to properly configure the corresponding AOUTx and AINx in the [216] (page 50) group.

MENU \ SETTINGS \ FUNCTIONS \ EXTERNAL THERMAL PROTECTION (ETP)

Name [ID]	Description	Def.
ETP Type [861]	Turning on / off the external thermal protection (ETP) function and selecting the connected temperature sensor type. Number of sensors connected in series is set by the parameter Sensor count [862] (page 78).	ETP turned off
ETP turned off	Converter does not evaluate external temperature.	

Name [ID]	Description	Def.
PT100	External temperature sensor is one or more PT100 sensors.	
KTY83/85	External temperature sensor is one or more KTY83/85 sensors.	
KTY81/82/84	External temperature sensor is one or more KTY81/82/84 sensors.	
Custom sensor	External temperature sensor is one or more user defined temperature sensors, which transmission characteristics is defined by the Resistance by 20°C [863] (page 79) and Resistance in 100°C [864] (page 79) parameters/	
PTC thermistor	External temperature sensor is one or more PTC thermistors, which threshold temperature is defined in the ETP Fault [866] (page 78) parameter. ETP warning occurs after exceeding the sensor resistance beyond 300 ohm and an ETP fault occurs after exceeding the sensor resistance beyond 1000 ohm. Drop under 550 ohm causes the fault to disappear.	
Voltage source ETP [906]	ETP sensor voltage measurement source signal settings. It is also necessary to feed the sensor from an analog output, whose function is selected as "ETP Current".	AIN1
AIN1	Voltage on the thermal sensor is connected to AIN1 (0-10V).	
AIN2	Voltage on the thermal sensor is connected to AIN2 (0-10V).	
AIN3	Voltage on the thermal sensor is connected to AIN3 (0-10V).	
AIN4	Voltage on the thermal sensor is connected to AIN4 (0-10V)	
Special	The source of the measurement is the special signal U ETP Signal [857] (page 79).	
Sensor count [862]	Serially connected external temperature sensors count.	1
1 ÷ 10	In case the motor or other device is equipped with multiple identical temperature sensors (coils, bearings), it is possible to connect them serially, and the count will be defined in this parameter. Any combination of thermal sensors in the windings and bearings is not allowed!	
ETP Warning [865]	Temperature in the external sensor temperature scanning point, in which the converter generates warning " W13-External temperature (page 27)".	90,0 °C
-500,0 °C ÷ 500,0 °C	In case that there are multiple serially connected sensors of an identical type, it is the average temperature from the multiple measuring points.	
ETP Fault [866]	Temperature, in which the converter generates increased temperature faults in the external sensor temperature scanning point. Represents the threshold sensor temperature by 1000ohm when using the ETP=PTC thermistor type. Fault occurs after exceeding this temperature.	110,0 °C
-500,0 °C ÷ 500,0 °C	In case that there are multiple serially connected sensors of an identical type, it is the average temperature from the multiple measuring points.	
Low ETP temperature [1283]	When ETP temperature drops below this value, converter generates a fault E38-ETP temperature (page 31) because of the extremely low temperatures, which can be caused by incorrect wiring or damage of ETP sensor. When ETP Type set to "PTC thermistor", this parameter has no meaning.	-100,0 °C
-500,0 °C ÷ 500,0 °C		
ETP maximal current [1087]	Maximal ETP measuring current.	10,00 mA
0,01 mA ÷ 20,00 mA	Restricts the current to the EHP sensors to prevent undesired overheating of the sensor. If a special sensor is used, it is necessary to set the maximal current according to its specification. In the EHP = PTC type, the measuring current is limited to the 1mA value and in the PT100 type to 3mA and then this parameter is inactive.	

CUSTOM SENSOR

Group of parameters number [810]
Setting the characteristic of the custom ETP sensor (if "Custom sensor" is selected in ETP Type [861] (page 77)).

MENU \ SETTINGS \ FUNCTIONS \ EXTERNAL THERMAL PROTECTION (ETP) \ CUSTOM SENSOR

Name [ID]	Description	Def.

Name [ID]	Description	Def.
Resistance by 20°C [863]	Resistance value of an external temperature sensor in 20°C, in case that the sensor characteristics is user-defined.	1200,0 Ω
0,1 Ω ÷ 99000,0 Ω		
Resistance in 100°C [864]	Resistance value of an external temperature sensor in 100°C, in case that the sensor characteristics is user-defined.	4600,0 Ω
0,1 Ω ÷ 99000,0 Ω		

SPECIAL SETTING ETP
Group of parameters number [569]
Special source setting for the ETP voltage drop measurement.

MENU \ SETTINGS \ FUNCTIONS \ EXTERNAL THERMAL PROTECTION (ETP) \ SPECIAL SETTING ETP

Name [ID]	Description	Def.
U ETP Signal [857]	Selecting the signal, which should be evaluated as voltage on the ETP sensor.	-
Signal	Usually an analog input in the 0 to 10 V mode is used.	

7.7 FAULTS AND WARNINGS

Group of parameters number [136]
Setting the parameters affecting the conditions of generation and termination of converter fault states.

MENU \ SETTINGS \ FAULTS AND WARNINGS

Name [ID]	Description	Def.
Clear history [500]	This command clears the converter fault history. There will be no record in the history.	

7.7.1 OPTIONAL FAULTS

Group of parameters number [190]
Turning on / off the evaluation of some fault states.

MENU \ SETTINGS \ FAULTS AND WARNINGS \ OPTIONAL FAULTS

Name [ID]	Description	Def.
Input phase loss [337]	Turning on the converter input phase loss evaluation. It is recommended to leave the input phase loss evaluation turned on, because in the converter continuous two-phase operation there is a risk of damage to the power capacitors. It is turned off in special cases only, when the supply grid is of poor quality or when the fault " E13-Input phase loss (page 30)" interrupts the operation unnecessary often.	Is evaluated
Is not evaluated	Fault " E13-Input phase loss (page 30)" is not evaluated.	
Is evaluated	Fault " E13-Input phase loss (page 30)" is evaluated.	
Output phase loss [338]	Turning on the converter output phases loss evaluation. The criteria for evaluation of this fault is current phase asymmetry of 30%, calculated from the nominal current of the converter.	Is evaluated
Is not evaluated	Fault " E2-Output phase outage (page 30)" is not evaluated.	
Is evaluated	Fault " E2-Output phase outage (page 30)" is evaluated.	
Motor overloading [27]	Setting the method of evaluating the motor (load) thermal overloading.	Self-cooling
Not evaluated	Converter does not evaluate the thermal overload of the connected device.	
Self-cooling	Fault " E29-Motor overload (page 31)" is evaluated according to the motor temperature model considering the motor rotation speed. In this mode, the generation of warning " W17-MT Overload (page 28)" or fault " E29-Motor overload (page 31)" at low motor speed may occur even for current lower than **Chyba! Nenašiel sa žiaden zdroj odkazov.**	

Name [ID]	Description	Def.
	(page **Chyba! Záložka nie je definovaná.**).	
Forced cooling	Fault " E29-Motor overload (page 31)" is evaluated according to the motor temperature model without considering the motor rotation speed.	
AIN Fault [837]	This parameter turns on / off the evaluation of analog input faults. The fault is evaluated only if the input is set to 4-20mA or 2-10V, output value is under the minimal value and the fault evaluation is turned on.	Is evaluated
Is evaluated	If the analog input is for a long time under the minimal value, the converter generates the fault.	
Is not evaluated	Converter accepts any analog input value.	
Overfrequency [85]	Turning on the fault evaluation for exceeding the stator limit frequency. Fault " E10-Overfrequency (page 30)" can indicate controller loop faults or incorrect parameters settings. This fault protects the mechanical components of the device when the converter and technological device positions increase the converter output frequency beyond control. Fault occurs, if the output frequency exceeds the value Overfrequency limit [97] (page 80). Origin of this fault may indicate incorrect configuration of the control algorithms.	Is not evaluated
Is not evaluated	Fault " E10-Overfrequency (page 30)" is not evaluated.	
Is evaluated	Fault " E10-Overfrequency (page 30)" is evaluated.	
Overfrequency limit [97]	Defines the stator frequency limit for evaluation of the fault " E10-Overfrequency (page 30)".	3050,00 Hz
0,00 Hz ÷ 3050,00 Hz	Fault occurs if the fault evaluation is turned on in Overfrequency [85] (page 80) and the converter output frequency exceeds this limit for a time longer than 1 second.	
External fault source [225]	Setting the source of the external fault. If the source is active, the fault " E7-External fault (page 30)" is generated. Is used as an emergency stop. Fault blocks the converter operation.	None
Look choises of parameter's Quick stop source. [986] (page 36)		

SPECIAL SETTING

Group of parameters number [554]
Setting the special source of the external fault.

MENU \ SETTINGS \ FAULTS AND WARNINGS \ OPTIONAL FAULTS \ SPECIAL SETTING

Name [ID]	Description	Def.
Ext. fault signal [527]	Signal that is evaluated if the fault " E7-External fault (page 30)" occurs or not. Either numeric or discrete signal can be chosen.	[184] Binary inputs
Signal		
External fault [528]	Conditions for external fault.	
Look choises of parameter's Binary inputs [184] (page 18)		
External fault inactive [529]	External fault deactivation: In case of a numeric signal if the signal value is lower than the defined level.	
Look choises of parameter's Binary inputs [184] (page 18)		

7.7.2 FAULT ACKNOWLEDGEMENT

Group of parameters number [164]
Mode of operation after the fault and conditions settings for the converter block after a high number of faults.

MENU \ SETTINGS \ FAULTS AND WARNINGS \ FAULT ACKNOWLEDGEMENT

Name [ID]	Description	Def.
Fault acknowledgement source [165]	Setting the method of acknowledgement the fault state. If the cause no longer exists (high current, low voltage), the fault state ends - will be confirmed by the configured fault confirmation method.	Automatically

Name [ID]	Description	Def.
Control panel	Fault will be acknowledged by the control panel.	
Automatically	Fault will be acknowledged automatically.	
BIN1	Fault is acknowledged by activating the 1st binary input.	
BIN2	Fault is acknowledged by activating the 2nd binary input.	
BIN3	Fault is acknowledged by activating the 3rd binary input.	
BIN4	Fault is acknowledged by activating the 4th binary input.	
BIN5	Fault is acknowledged by activating the 5th binary input.	
BIN6	Fault is acknowledged by activating the 6th binary input.	
MODBUS	Fault is acknowledged over the MODBUS communication interface.	
PROFIBUS	Fault is acknowledged over the PROFIBUS communication interface.	
Special	Fault is acknowledged over the special settings [566] (page 81).	
Time after fault [428]	When the cause of the fault no longer exists (for example overcurrent), the fault duration time will be prolonged by the defined time.	5,0 s
0,0 s ÷ 3600,0 s	E.g. 5 s means that every fault will last for at least 5 seconds.	
Max. fault count [431]	Maximal fault count that can occur in the time defined by Min. fault period [432] (page 81).	5
5 ÷ 20	Protects the converter or device against frequent faults, which could cause permanent damage to the converter or connected device. If a certain frequency of fault occurence is exceeded, the converter generates the fault " E31-Too many faults (page 31)".	
Min. fault period [432]	Time, in which the maximal fault count can occur Max. fault count [431] (page 81). If there are more faults, the fault " E31-Too many faults (page 31)" is generated.	24,0 h
5,0 h ÷ 72,0 h		

SPECIAL SETTING

Group of parameters number [566]

Setting the special source of fault confirmation, e.g. in the chosen time of day or over the analog input.

MENU \ SETTINGS \ FAULTS AND WARNINGS \ FAULT ACKNOWLEDGEMENT \ SPECIAL SETTING

Name [ID]	Description	Def.
Acknowledgement signal [509]	Signal for fault acknowledgement.	[86] Permanent state
Signal		
Acknowledgement [510]	Condition of fault acknowledgement.	Automatically
Look choises of parameter's **Chyba! Nenašiel sa žiaden zdroj odkazov.** (page **Chyba! Záložka nie je definovaná.**)		
Confirmation inactive [511]	Confirmation inactive: In case of a numeric signal if the signal value is lower than the defined level.	
Look choises of parameter's **Chyba! Nenašiel sa žiaden zdroj odkazov.** (page **Chyba! Záložka nie je definovaná.**)		

7.7.3 QUANTITIES TO LOG

Group of parameters number [246]

Selection of quantities, which should be logged to history when an event occurs (faults, warnings...).

MENU \ SETTINGS \ FAULTS AND WARNINGS \ QUANTITIES TO LOG

Name [ID]	Description	Def.
Value 1 [247]	Selection of the first optional quantity which will be logged to the history. When an event occurs (fault), its actual value will be stored.	[75] CB temperature
Signal		

Name [ID]	Description	Def.
Value 2 [248]	Selection of the second optional quantity which will be logged to the history. When an event occurs (fault), its actual value will be stored.	[74] Cooler temperature
Signal		
Value 3 [249]	Selection of the third optional quantity which will be logged to the history. When an event occurs (fault), its actual value will be stored.	[76] Converter state
Signal		
Do not log [746]	Determines if some faults will not be logged to the fault history. This parameter does not influence the fault evaluation itself.	Undervoltage
■ Undervoltage	Fault " E5-Undervoltage (page 30)" will not be logged to the fault history.	
□ Supply overload	Fault " E16-Supply overload (page 30)" will not be logged to the fault history.	
□ Safety input	Fault " E14-Safety input (page 30)" will not be logged to the fault history.	
Par. changed [1175]	Allows creating the parameter changes history.	Control panel
■ Control panel	All parameter changes by control panel are recorded.	
□ MODBUS	All parameter changes over MODBUS are recorded.	
□ PROFIBUS	All parameter changes over PROFIBUS are recorded.	

7.7.4 WARNINGS

Group of parameters number [964]
Setting the conditions of generating the individual warnings and their storing to the fault history.

MENU \ SETTINGS \ FAULTS AND WARNINGS \ WARNINGS

Name [ID]	Description	Def.
Warnings [705]	Restricts the displayed warnings to the list of more important warnings.	Basic
Basic	Some warnings, which are not neccesary for basic users, will be suppressed.	
Expert	All available warnings and function messages will be displayed.	
Cooler temperature warning [767]	Temperature, at which the cooler displays a warning " W6-Cooler temperature (page 27)".	75,0 °C
40,0 °C ÷ 120,0 °C		
CB temperature warning [204]	Temperature, at which the converter displays a Control board (CB) overheat warning " W7-CB temperature (page 27)".	55,0 °C
20,0 ÷ Fault[3]	[3]*Refer to chapter 3.2* Temperatures *(str. 15) by product type.*	
External warning source [560]	External warning source settings. If the source is active, the warning " W49-External warning (page 29)" becomes active. It is used as signalization of any desired event. It does not influence the converter operation.	None
Look choises of parameter's Quick stop source. [986] (page 36)		
Warning log [968]	Selection from warnings 1-32, which will be logged to the fault history at the time they occur.	
Look choises of parameter's Warning [250] (page 22)		
Warning log 2 [969]	Selection from warnings 33-64, which will be logged to the fault history at the time they occur.	
Look choises of parameter's Warning2 [424] (page 22)		

SPECIAL SETTING

Group of parameters number [563]
Setting the special source of external warning

MENU \ SETTINGS \ FAULTS AND WARNINGS \ WARNINGS \ SPECIAL SETTING

Name [ID]	Description	Def.
Ext. warning signal [965]	Signal that is evaluated if the warning " W49-External warning (page 29)" occurs or not. It is used as an external event warning. Warning does not block the	[184] Binary

Name [ID]	Description	Def.
	converter operation. Either numeric or discrete signal can be chosen.	inputs
Signal		
Ext. warning [966]	Conditions for external warning.	
Look choises of parameter's Binary inputs [184] (page 18)		
Ext. warning inactive [967]	External warning is deactivated: In case of a numeric signal if the signal value is lower than the defined level.	
Look choises of parameter's Binary inputs [184] (page 18)		

7.8 DISPLAY

Group of parameters number [48]
Selecting the parameters displayed on the control panel.

7.8.1 DISP. QUANT. SETTINGS

Group of parameters number [88]
Displayed quantities settings. Quantities that are displayed in the upper part of the display in the MONITOR, SETTINGS and DIAGNOSTICS window.

MENU \ SETTINGS \ DISPLAY \ DISP. QUANT. SETTINGS

Name [ID]	Description	Def.
DV 1 [51]	Selecting the first displayed quantity.	[210] Date
Signal		
DV 2 [52]	Selecting the second displayed quantity.	[209] Time
Signal		

7.8.2 MONITOR SETTING

Group of parameters number [1214]
Displayed quantities settings. Quantities that are displayed in the upper part of the display in the MONITOR, SETTINGS and DIAGNOSTICS window.

MENU \ SETTINGS \ DISPLAY \ MONITOR SETTING

Name [ID]	Description	Def.
Monitor 1 [53]	Selecting the quantity that will be displayed in the monitor window in the first row.	[47] Freq. INV
Signal		
Monitor 2 [54]	Selecting the quantity that will be displayed in the monitor window in the second row.	[46] Voltage DC
Signal		
Monitor 3 [55]	Selecting the quantity that will be displayed in the monitor window in the third row.	[42] Current
Signal		
Monitor 4 [56]	Selecting the quantity that will be displayed in the monitor window in the fourth row.	[184] Binary inputs
Signal		
Monitor 5 [57]	Selecting the quantity that will be displayed in the monitor window in the fifth row.	[74] Cooler temperature
Signal		
Timeout panel [198]	Setting the communication timeout for the control panel.	100 ms
15 ms ÷ 200 ms		
LANGUAGE [231]	Language change.	Slovensky

Name [ID]	Description	Def.
Slovensky | English		

7.9 COMMUNICATION

Group of parameters number [213]
Setting the serial communication of the converter.

MENU \ SETTINGS \ COMMUNICATION

Name [ID]	Description	Def.
Converter address [234]	Address is used for identification of the device. It is the sum of preset address and Address shift [1155] (page 84). It is also used for the communication with the control panel. In case that more converters are connected, every converter has to have unique address.	1
1 ÷ 99		
Address shift [1155]	Selection of bits, which create the external address. The weight of the bits is applied by the order of the selections. Communication address is then calculated as a sum of the external address and the parameter Converter address [234] (page 84).	
Look choises of parameter's Bit1 DS mask [553] (page 41)		
Statistics reset [238]	Statistics reset in the serial communication diagnostics. (number of messages, number of fault messages,...)	

7.9.1 MODBUS

Group of parameters number [658]
Setting the MODBUS communication protocol. VONSCH implementation of MODBUS protocol is MODBUS RTU specification compliant.
Detailed description of MODBUS communication protocol can be found on www.vonsch.sk, in the section Support.

MENU \ SETTINGS \ COMMUNICATION \ MODBUS

Name [ID]	Description	Def.
Baud RS485 [218]	RS 485 serial port communication baud rate setting.	115,200 Bps
9600 Bps		
19,200 Bps		
38,400 Bps		
57,600 Bps		
115,200 Bps		
128,000 Bps		
115,200s Bps	preklad	
Baud ext. module [230]	Extension module serial port communication speed. Extension module is optional.	115,200 Bps
Look choises of parameter's Baud RS485 [218] (page 84)		
MB Idle [961]	Selecting how the converter should react when it is not communicating with the Modbus master. After the defined idle time the warning occurs, or the fault. Or first the warning and then the fault.	
□ Fault	The converter generates the fault " E42-Modbus Timeout (page 32)", when no valid request or broadcast (if allowed) is received from the Modbus master within the preset time.	
□ Warning	The converter generates the warning " W42-Modbus Timeout (page 29)", when no valid request or broadcast (if allowed) is received from the Modbus master within the preset time.	
□ Fault CW	The converter generates the fault " E42-Modbus Timeout (page 32)", when no control word or setpoint is received in valid request or broadcast(if allowed) from the Modbus master within the preset time.	

Name [ID]	Description	Def.
□ Warning CW	The converter generates the warning " W42-Modbus Timeout (page 29)", when no control word or setpoint is received in valid request or broadcast(if allowed) from the Modbus master within the preset time.	
MB Fault timeout [659]	Timeout of communication interruption with Master. After this time, fault E42-Modbus Timeout (page 32) is generated.	5,00 s
0,10 s ÷ 3600,00 s		
MB Warning timeout [962]	Timeout of communication interruption with Master. After this time, warning " W42-Modbus Timeout (page 29)" is generated. If a Modbus protocol fault and warning are evaluated at the same time, see MB Idle [961] (page 84), then this parameter must be lower than the parameter MB Fault timeout [659] (page 85), otherwise the warning will not be generated.	2,00 s
0,10 s ÷ 3600,00 s		
MB Warning mode [963]	Defines what action should the converter take after Modbus warning occurs.	Reset
Look choises of parameter's PB Warning mode [816] (page 87)		
Broadcast [1156]	Turning on / off the broadcasts. Broadcast is a message which is sent to all recipients simultaneously.	Yes
Yes	Broadcasts are turned on and the converter is processing them.	
No	Broadcasts are turned off and the converter is ignoring them.	
DataFormat [660]	This parameter defines the order of transferring single bytes. This change of format is only applied for the 485 line. This is the parameter data, SW, CW, and accelerated block transfer. By default, 32-bit data 0xHhHlLhLl is transmitted in the order 0xHh, 0xHl, 0xLh, 0xLl.	No swap
No swap	32 bit data are transfered in the byte order: 0xHh, 0xHl, 0xLh, 0xLl.	
Byte swap	32 bit data are transfered in the byte order: 0xHl, 0xHh, 0xLl, 0xLh.	
Word swap	32 bit data are transfered in the byte order: 0xLh, 0xLl, 0xHh, 0xHl.	
Byte & word swap	32 bit data are transfered in the byte order: 0xLl, 0xLh, 0xHl, 0xHh.	
MB counters [1556]	preklad	RS485 | Ext. module
□ USB | ■ RS485 | ■ Ext. module		

Parameters MODBUS

Group of parameters number [573]
Parameter selection (mapping) for the Modbus communication fast block transfer.

MENU \ SETTINGS \ COMMUNICATION \ MODBUS \ PARAMETERS MODBUS

Name [ID]	Description	Def.
ID 0 [1094]		-
Signal		
ID 1 [1095]		-
Signal		
ID 2 [1096]		-
Signal		
ID 3 [1097]		-
Signal		
ID 4 [1098]		-
Signal		
ID 5 [1099]		-

Name [ID]	Description	Def.
Signal		
ID 6 [1100]		-
Signal		
ID 7 [1101]		-
Signal		
ID 8 [1102]		-
Signal		
ID 9 [1103]		-
Signal		
ID 10 [1104]		-
Signal		
ID 11 [1105]		-
Signal		
ID 12 [1106]		-
Signal		
ID 13 [1107]		-
Signal		
ID 14 [1108]		-
Signal		
ID 15 [1109]		-
Signal		
ID 16 [1110]		-
Signal		
ID 17 [1111]		-
Signal		
ID 18 [1112]		-
Signal		
ID 19 [1113]		-
Signal		
ID 20 [1114]		-
Signal		
ID 21 [1115]		-
Signal		
ID 22 [1116]		-
Signal		
ID 23 [1117]		-
Signal		
ID 24 [1118]		-
Signal		
ID 25 [1119]		-
Signal		
ID 26 [1120]		-
Signal		
ID 27 [1121]		-
Signal		
ID 28 [1122]		-
Signal		
ID 29 [1123]		-
Signal		

Name [ID]	Description	Def.
ID 30 [1124]		-
Signal		
ID 31 [1125]		-
Signal		
ID 32 [1126]		-
Signal		
Shift value [1512]	It is used for special holding registers over broadcast.	1
-99 ÷ 99		
Shift mask [1513]	It is used for special holding registers over broadcast.	
Look choises of parameter's Bit1 DS mask [553] (page 41)		
Step 0 [1514]	Setting of the step. It serves to determine how to recalculate 16-bit special holding register to the selected variable set by ID 0.	0
-8 ÷ 8	For selected value 0, 16bit number 123 is recalculated to 32bit number as 123. For value 1, 123 is recalculated as 12.3.	

7.9.2 PROFIBUS

Group of parameters number [812]

Profibus is an open serial communication standard. Extension module Vonsch Profibus_UNI fully supports the Profibus DP standard.

Detailed description of PROFIBUS communication protocol can be found on www.vonsch.sk, in the section Support.

MENU \ SETTINGS \ COMMUNICATION \ PROFIBUS

Name [ID]	Description	Def.
PB Idle [813]	Selecting the way of reaction of the converter to communication error, when either converter or master do not communicate with the Profibus module. After the defined idle time, warning " W41-Profibus Timeout (page 29)" or fault " E37-Profibus Timeout (page 31)" is generated.	
□ Fault | □ Warning		
PB Fault timeout [814]	Timeout of communication interruption with Master. After this time, fault E37-Profibus Timeout (page 31) is generated.	5,00 s
0,10 s ÷ 3600,00 s		
PB Warning timeout [815]	MODBUS communication timeout, After communication error longer than this time, warning " W41-Profibus Timeout (page 29)" is generated. If a Modbus protocol fault and warning are evaluated at the same time, see PB Idle [813] (page 87), then this parameter must be lower than the parameter PB Fault timeout [814] (page 87), otherwise the warning is not generated.	2,00 s
0,10 s ÷ 3600,00 s		
PB Warning mode [816]	Defines what action should the converter take after warning " W41-Profibus Timeout (page 29)" occurs.	Reset
Reset	Converter goes to reset.	
Stop	Converter stops.	
Quick stop	Converter stops (Quick stop).	
Nothing.	Converter will not respond to warnings.	
PB Type [1486]	Specifies the format of transmission of operational variables.	Unifrem
Unifrem	It is possible to simultaneously transmit two variables only in the format described by the documentation.	

Name [ID]	Description	Def.
VQFREM	It is possible to transmit 4 values as 16-bit numbers.	

7.10 PAR. SETS

Group of parameters number [206]
Selecting a set of parameters for the converter operation.

MENU \ SETTINGS \ PAR. SETS

Name [ID]	Description	Def.
Set switching [657]	Setting the way of switching between the sets.	Combined
Combined	Only the first 2 bits of the binary switch are used. Output set corresponds to the binary combination of these bits. If no bits are active, the 1st set is active. If only 1 bit is active, the 2nd set is active. and so on.	
Single	Every single bit of the binary switch represents one set (bit 1 represents set 2). If more switches are active, the set with the higher sequence number is active. If no binary switch is active, the 1st set is active.	
Parameter	It is possible to set the active set using the Active set [205] (page 88) parameter.	
Active set [205]	Switches the active set of parameters, from which the converter will take its configuration.	Set 1
Set 1	Converter will take its configuration from 1st set of parameters.	
Set 2	Converter will take its configuration from 2nd set of parameters.	
Set 3	Converter will take its configuration from 3rd set of parameters.	
Set 4	Converter will take its configuration from 4th set of parameters.	
Switch while run [1490]	Enabling or disabling of set switching during motor operation.	Enabled
Disabled	Sets can be switched only when motor is not running.	
Enabled	Sets can be switched even when motor is running.	

7.10.1 SET SWITCH

Group of parameters number [222]
Binary set switch setting.

MENU \ SETTINGS \ PAR. SETS \ SET SWITCH

Name [ID]	Description	Def.
Bit1 set source [641]	Setting the 1st bit of the set switch. Its function depends on the Set switching [657] (page 88) parameter setting.	None
Look choises of parameter's Quick stop source. [986] (page 36)		
Bit2 set source [642]	Setting the 2nd bit of the set switch. Its function depends on the Set switching [657] (page 88) parameter setting.	None
Look choises of parameter's Quick stop source. [986] (page 36)		
Bit3 set source [643]	Setting the 3rd bit of the set switch. Its function depends on the Set switching [657] (page 88) parameter setting.	None
Look choises of parameter's Quick stop source. [986] (page 36)		

SPECIAL SETTING

Group of parameters number [224]
Special functions setting for the set switches.

MENU \ SETTINGS \ PAR. SETS \ SET SWITCH \ SPECIAL SETTING

Name [ID]	Description	Def.
Bit1 set signal	Signal that is evaluated if the 1st bit of the binary switch is active. Either	[184] Binary

Name [ID]	Description	Def.
[645]	numeric or discrete signal can be chosen.	inputs
Signal		
Bit1 set switch-on [646]	Conditions for switching on Bit1.	
Look choises of parameter's Binary inputs [184] (page 18)		
Bit1 set switch-off [647]	Bit1 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	
Look choises of parameter's Binary inputs [184] (page 18)		
Bit2 set signal [648]	Signal that is evaluated if the 2nd bit of the binary switch is active. Either numeric or discrete signal can be chosen.	[184] Binary inputs
Signal		
Bit2 set switch-on [649]	Conditions for switching on Bit2.	
Look choises of parameter's Binary inputs [184] (page 18)		
Bit2 set switch-off [650]	Bit2 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	
Look choises of parameter's Binary inputs [184] (page 18)		
Bit3 set signal [651]	Signal that is evaluated if the 3rd bit of the binary switch is active. Either numeric or discrete signal can be chosen.	[184] Binary inputs
Signal		
Bit3 set switch-on [652]	Conditions for switching on Bit3.	
Look choises of parameter's Binary inputs [184] (page 18)		
Bit3 set switch-off [653]	Bit3 switch-off: In case of a numeric signal if the signal value is lower than the defined level.	
Look choises of parameter's Binary inputs [184] (page 18)		

7.10.2 USER SETS

Group of parameters number [1290]

Settings of user sets. These sets can store up to 20 selected parameters. There is available up to 32 different values for each selected parameter.

MENU \ SETTINGS \ PAR. SETS \ USER SETS

Name [ID]	Description	Def.
Switch sets [1480]	Switching of user sets. Selection of binary combination of individual sets. Its value represents the actual foursome of sets. First three selected bits are applied. Switch switches the foursome of sets 1-4, 5-9, ... Selection of a specific set from the selected foursome depends on the switching of normal sets.	
Look choises of parameter's Bit1 DS mask [553] (page 41)		
Set shift [1483]	Set shift allows to assign different set as intended to the combination of set switch. The set switch is combined as normal and user set switch.	0
-31 ÷ 31	If the shift is 0, the binary switch 00000 corresponds to set 1, 00001 - set 2, etc. If the shift is 1, 00000 corresponds to set 2, 00001 - set 3, etc ...	
User set [1481]	Number of active user set.	

PARAMS SELECT

Group of parameters number [1291]

Selection of 20 parameters that can store up to 32 different values. After selecting the parameter, its value can not be changed in its original location, but in the user sets for the selected set.

MENU \ SETTINGS \ PAR. SETS \ USER SETS \ PARAMS SELECT

Name [ID]	Description	Def.
Param 1 [1300]		-
Signal		
Param 2 [1301]		-
Signal		
Param 3 [1302]		-
Signal		
Param 4 [1303]		-
Signal		
Param 5 [1304]		-
Signal		
Param 6 [1305]		-
Signal		
Param 7 [1306]		-
Signal		
Param 8 [1307]		-
Signal		
Param 9 [1308]		-
Signal		
Param 10 [1309]		-
Signal		
Param 11 [1310]		-
Signal		
Param 12 [1311]		-
Signal		
Param 13 [1312]		-
Signal		
Param 14 [1313]		-
Signal		
Param 15 [1314]		-
Signal		
Param 16 [1315]		-
Signal		
Param 17 [1316]		-
Signal		
Param 18 [1317]		-
Signal		
Param 19 [1318]		-
Signal		
Param 20 [1319]		-
Signal		

SET 1-4

Group of parameters number [1292]

Settings of selected parameters for sets 1 to 4. Settings of individual sets can be done by F3 key on the control panel, for a particular parameter.

MENU \ SETTINGS \ PAR. SETS \ USER SETS \ SET 1-4

Name [ID]	Description	Def.
N1_1 [1320]		-

Name [ID]	Description	Def.
- ÷ -		
N1_2 [1321]		-
- ÷ -		
N1_3 [1322]		-
- ÷ -		
N1_4 [1323]		-
- ÷ -		
N1_5 [1324]		-
- ÷ -		
N1_6 [1325]		-
- ÷ -		
N1_7 [1326]		-
- ÷ -		
N1_8 [1327]		-
- ÷ -		
N1_9 [1328]		-
- ÷ -		
N1_10 [1329]		-
- ÷ -		
N1_11 [1330]		-
- ÷ -		
N1_12 [1331]		-
- ÷ -		
N1_13 [1332]		-
- ÷ -		
N1_14 [1333]		-
- ÷ -		
N1_15 [1334]		-
- ÷ -		
N1_16 [1335]		-
- ÷ -		
N1_17 [1336]		-
- ÷ -		
N1_18 [1337]		-
- ÷ -		
N1_19 [1338]		-
- ÷ -		
N1_20 [1339]		-
- ÷ -		

SET 5-8

Group of parameters number [1293]

Settings of selected parameters for sets 5 to 8. Settings of individual sets can be done by F3 key on the control panel, for a particular parameter.

MENU \ SETTINGS \ PAR. SETS \ USER SETS \ SET 5-8

Name [ID]	Description	Def.
N5_1 [1340]		-
- ÷ -		

Name [ID]	Description	Def.
N5_2 [1341]		-
- ÷ -		
N5_3 [1342]		-
- ÷ -		
N5_4 [1343]		-
- ÷ -		
N5_5 [1344]		-
- ÷ -		
N5_6 [1345]		-
- ÷ -		
N5_7 [1346]		-
- ÷ -		
N5_8 [1347]		-
- ÷ -		
N5_9 [1348]		-
- ÷ -		
N5_10 [1349]		-
- ÷ -		
N5_11 [1350]		-
- ÷ -		
N5_12 [1351]		-
- ÷ -		
N5_13 [1352]		-
- ÷ -		
N5_14 [1353]		-
- ÷ -		
N5_15 [1354]		-
- ÷ -		
N5_16 [1355]		-
- ÷ -		
N5_17 [1356]		-
- ÷ -		
N5_18 [1357]		-
- ÷ -		
N5_19 [1358]		-
- ÷ -		
N5_20 [1359]		-
- ÷ -		

SET 9-12

Group of parameters number [1294]

Settings of selected parameters for sets 9 to 12. Settings of individual sets can be done by F3 key on the control panel, for a particular parameter.

MENU \ SETTINGS \ PAR. SETS \ USER SETS \ SET 9-12

Name [ID]	Description	Def.
N9_1 [1360]		-
- ÷ -		
N9_2 [1361]		-

Name [ID]	Description	Def.
- ÷ -		
N9_3 [1362]		-
- ÷ -		
N9_4 [1363]		-
- ÷ -		
N9_5 [1364]		-
- ÷ -		
N9_6 [1365]		-
- ÷ -		
N9_7 [1366]		-
- ÷ -		
N9_8 [1367]		-
- ÷ -		
N9_9 [1368]		-
- ÷ -		
N9_10 [1369]		-
- ÷ -		
N9_11 [1370]		-
- ÷ -		
N9_12 [1371]		-
- ÷ -		
N9_13 [1372]		-
- ÷ -		
N9_14 [1373]		-
- ÷ -		
N9_15 [1374]		-
- ÷ -		
N9_16 [1375]		-
- ÷ -		
N9_17 [1376]		-
- ÷ -		
N9_18 [1377]		-
- ÷ -		
N9_19 [1378]		-
- ÷ -		
N9_20 [1379]		-
- ÷ -		

SET 13-16

Group of parameters number [1295]

Settings of selected parameters for sets 13 to 16. Settings of individual sets can be done by F3 key on the control panel, for a particular parameter.

MENU \ SETTINGS \ PAR. SETS \ USER SETS \ SET 13-16

Name [ID]	Description	Def.
N13_1 [1380]		-
- ÷ -		
N13_2 [1381]		-
- ÷ -		

Name [ID]	Description	Def.
N13_3 [1382]		-
- ÷ -		
N13_4 [1383]		-
- ÷ -		
N13_5 [1384]		-
- ÷ -		
N13_6 [1385]		-
- ÷ -		
N13_7 [1386]		-
- ÷ -		
N13_8 [1387]		-
- ÷ -		
N13_9 [1388]		-
- ÷ -		
N13_10 [1389]		-
- ÷ -		
N13_11 [1390]		-
- ÷ -		
N13_12 [1391]		-
- ÷ -		
N13_13 [1392]		-
- ÷ -		
N13_14 [1393]		-
- ÷ -		
N13_15 [1394]		-
- ÷ -		
N13_16 [1395]		-
- ÷ -		
N13_17 [1396]		-
- ÷ -		
N13_18 [1397]		-
- ÷ -		
N13_19 [1398]		-
- ÷ -		
N13_20 [1399]		-
- ÷ -		

SET 17-20

Group of parameters number [1296]

Settings of selected parameters for sets 17 to 20. Settings of individual sets can be done by F3 key on the control panel, for a particular parameter.

MENU \ SETTINGS \ PAR. SETS \ USER SETS \ SET 17-20

Name [ID]	Description	Def.
N17_1 [1400]		-
- ÷ -		
N17_2 [1401]		-
- ÷ -		
N17_3 [1402]		-

Name [ID]	Description	Def.
- ÷ -		
N17_4 [1403]		-
- ÷ -		
N17_5 [1404]		-
- ÷ -		
N17_6 [1405]		-
- ÷ -		
N17_7 [1406]		-
- ÷ -		
N17_8 [1407]		-
- ÷ -		
N17_9 [1408]		-
- ÷ -		
N17_10 [1409]		-
- ÷ -		
N17_11 [1410]		-
- ÷ -		
N17_12 [1411]		-
- ÷ -		
N17_13 [1412]		-
- ÷ -		
N17_14 [1413]		-
- ÷ -		
N17_15 [1414]		-
- ÷ -		
N17_16 [1415]		-
- ÷ -		
N17_17 [1416]		-
- ÷ -		
N17_18 [1417]		-
- ÷ -		
N17_19 [1418]		-
- ÷ -		
N17_20 [1419]		-
- ÷ -		

SET 21-24

Group of parameters number [1297]

Settings of selected parameters for sets 21 to 24. Settings of individual sets can be done by F3 key on the control panel, for a particular parameter.

MENU \ SETTINGS \ PAR. SETS \ USER SETS \ SET 21-24

Name [ID]	Description	Def.
N21_1 [1420]		-
- ÷ -		
N21_2 [1421]		-
- ÷ -		
N21_3 [1422]		-
- ÷ -		

Name [ID]	Description	Def.
N21_4 [1423]		-
- ÷ -		
N21_5 [1424]		-
- ÷ -		
N21_6 [1425]		-
- ÷ -		
N21_7 [1426]		-
- ÷ -		
N21_8 [1427]		-
- ÷ -		
N21_9 [1428]		-
- ÷ -		
N21_10 [1429]		-
- ÷ -		
N21_11 [1430]		-
- ÷ -		
N21_12 [1431]		-
- ÷ -		
N21_13 [1432]		-
- ÷ -		
N21_14 [1433]		-
- ÷ -		
N21_15 [1434]		-
- ÷ -		
N21_16 [1435]		-
- ÷ -		
N21_17 [1436]		-
- ÷ -		
N21_18 [1437]		-
- ÷ -		
N21_19 [1438]		-
- ÷ -		
N21_20 [1439]		-
- ÷ -		

SET 25-28

Group of parameters number [1298]

Settings of selected parameters for sets 25 to 28. Settings of individual sets can be done by F3 key on the control panel, for a particular parameter.

MENU \ SETTINGS \ PAR. SETS \ USER SETS \ SET 25-28

Name [ID]	Description	Def.
N25_1 [1440]		-
- ÷ -		
N25_2 [1441]		-
- ÷ -		
N25_3 [1442]		-
- ÷ -		
N25_4 [1443]		-

Name [ID]	Description	Def.
- ÷ -		
N25_5 [1444]		-
- ÷ -		
N25_6 [1445]		-
- ÷ -		
N25_7 [1446]		-
- ÷ -		
N25_8 [1447]		-
- ÷ -		
N25_9 [1448]		-
- ÷ -		
N25_10 [1449]		-
- ÷ -		
N25_11 [1450]		-
- ÷ -		
N25_12 [1451]		-
- ÷ -		
N25_13 [1452]		-
- ÷ -		
N25_14 [1453]		-
- ÷ -		
N25_15 [1454]		-
- ÷ -		
N25_16 [1455]		-
- ÷ -		
N25_17 [1456]		-
- ÷ -		
N25_18 [1457]		-
- ÷ -		
N25_19 [1458]		-
- ÷ -		
N25_20 [1459]		-
- ÷ -		

SET 29-32

Group of parameters number [1299]

Settings of selected parameters for sets 29 to 32. Settings of individual sets can be done by F3 key on the control panel, for a particular parameter.

MENU \ SETTINGS \ PAR. SETS \ USER SETS \ SET 29-32

Name [ID]	Description	Def.
N29_1 [1460]		-
- ÷ -		
N29_2 [1461]		-
- ÷ -		
N29_3 [1462]		-
- ÷ -		
N29_4 [1463]		-
- ÷ -		

Name [ID]	Description	Def.
N29_5 [1464]		-
- ÷ -		
N29_6 [1465]		-
- ÷ -		
N29_7 [1466]		-
- ÷ -		
N29_8 [1467]		-
- ÷ -		
N29_9 [1468]		-
- ÷ -		
N29_10 [1469]		-
- ÷ -		
N29_11 [1470]		-
- ÷ -		
N29_12 [1471]		-
- ÷ -		
N29_13 [1472]		-
- ÷ -		
N29_14 [1473]		-
- ÷ -		
N29_15 [1474]		-
- ÷ -		
N29_16 [1475]		-
- ÷ -		
N29_17 [1476]		-
- ÷ -		
N29_18 [1477]		-
- ÷ -		
N29_19 [1478]		-
- ÷ -		
N29_20 [1479]		-
- ÷ -		

8 Converter function configuration manual

8.1 Production (factory) settings

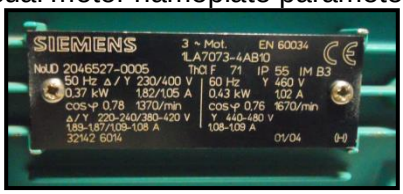
UNIFREM 400 XXX frequency converter are shipped with valid production (factory) parameter settings that can be restored at any time using the FACTORY SETTINGS command. Reseting to factory settings is suitable if the converter was already used in an unknown operation or if it is not shipped directly from VONSCH s.r.o. All configuration procedures in this manual are based on this converter setting.

SAVE / RESTORE –> Restore parameters –> Factory settings **(confirmation F2)**

Restoring of factory settings will overwrite all parameters, including configuration of control, inputs and outputs.

8.2 Motor parameters – MOTOR MACROS – identification

Parameters in the group SETTINGS –> LOAD (MOTOR) are important for proper function of individual converter functions. Here are mostly nameplate (nominal) values of a connected device (motor) and also some special parameters whose values are obtained by identification and tuning.

Parameter name	ID	Description
Nom. power [W]	**357**	Usual motor nameplate parameters. 
Nom. voltage [V]	**59**	
Nom. frequency [Hz]	**4**	
Nom. current [A]	**151**	
Nom.revolutions [ot/min]	**356**	
Motor power factor	**227**	
Output phase sequence	**326**	The option to change output phase sequence of the motor.
Iden. I0 a Lm	**384**	Turn on / turn off of the magnetizing current identification and magnetizing current value.
Magnetizing current [A]	**355**	
Time constant MT [s]	**79**	Parameter of MOTOR MACROS – Time constant of the motor excitation.
Identification RS	**383**	Turn on / turn off of the identification mode of the stator resistance. and stator resistance value.
Stator resistance [mΩ]	**345**	
Rotor resistance [mΩ]	**439**	Special parameters for the proper function of vector control.
Leakage inductance [mH]	**440**	
Mutual inductance [mH]	**441**	
Inertia moment [kg m2]	**442**	

Preset MOTOR MACROS should be „the springboard“ for the correct converter configuration. Converter connected to the motor should be always functional, after executing the MACRO, and by setting some additional functions. Required higher control quality is achieved in the process of tuning the parameters for a specific application during operating conditions.

Parameter ID: 672
SETTINGS –> MOTOR –> MOTOR MACROS

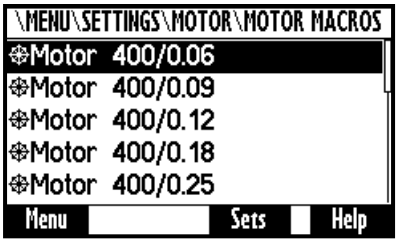


Table: Preset motor macros in frequency converters UNIFREM 400 XXX:

Motor power from 60W to 7,5kW:

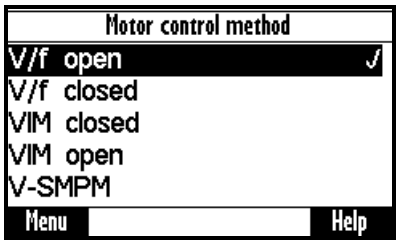
Parameter name	ID	Motor type 50Hz: voltage [V] / motor power [kW]														
		400/0,06	400/0,09	400/0,12	400/0,18	400/0,25	400/0,37	400/0,55	400/0,75	400/1,1	400/1,5	400/2.2	400/3	400/4	400/5.5	400/7.5
Nominal power [W]	357	60	90	120	180	250	370	550	750	1100	1500	2200	3000	4000	5500	7500
Nominal voltage [V]	59	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Nominal current [A]	151	0,2	0,29	0,42	0,56	0,76	1,03	1,45	1,86	2,55	3,4	4,7	6,4	8,2	11,4	15,2
Magnetizing current [A]	355	0,19	0,28	0,39	0,51	0,68	0,89	1,22	1,25	1,76	2,35	3,22	4,40	5,65	7,80	10,32
Nominal revolutions [1/min]	356	1350	1350	1350	1350	1350	1370	1395	1395	1415	1420	1420	1420	1440	1455	1455
Time constant MT [s]	79	0,05	0,052	0,0548	0,056	0,058	0,06	0,0752	0,096	0,12	0,14	0,178	0,2	0,225	0,255	0,31
Stator resistance [mΩ]	345	195000	110000	40000	36500	31000	24000	22000	18500	13175	7850	6105	4340	3400	2079,8	759,5
Rotor resistance [mΩ]	439	148200	83600	30400	27740	23560	18240	16720	14060	10013	5966	4639,8	3298,4	2584	1580,6	577,2
Leakage inductance [mH]	440	176	112	98	84	62	140	18	42	10	10	3	14	13	12	6
Mutual inductance [mH]	441	3284	2768	2002	1836	1568	1200	932	678	640	395	377	276	237	218	194
Inertia moment [kg m2]	442	0.00027	0,00027	0,0003	0,0004	0,0006	0,0008	0,0015	0,0018	0,0028	0,0035	0,0048	0,0058	0,011	0,018	0,024
Max. mot. current [A]	5	0,3	0,44	0,63	0,84	1,14	1,55	2,18	2,79	3,83	5,1	7,05	9,6	12,3	17,1	22,8
Max. regen. current [A]	549	0,3	0,44	0,63	0,84	1,14	1,55	2,18	2,79	3,83	5,1	7,05	9,6	12,3	17,1	22,8
STC Current [A]	163	0,19	0,28	0,4	0,53	0,72	0,98	1,38	1,77	2,42	3,23	4,47	6,08	7,79	10,83	14.44
Starting voltage of the V/f curve [%]	90	15,4	13,8	12,3	12,1	11,8	10,5	9,25	8,2	7,3	6,52	6,16	5,95	5,79	4,3	2,85
Max. torque [Nm]	481	1,6	2,5	3,4	3,7	3,85	4	6	10	14,8	20	29,4	40	54	74	100

Motor power from 11kW to 200kW:

Parameter name	ID	Motor type 50Hz: voltage [V] / motor power [kW]														
		400/11	400/15	400/18,5	400/22	400/30	400/37	400/45	400/55	400/75	400/90	400/100	400/110	400/132	400/160	400/200
Nominal power [W]	357	11000	15000	18500	22000	30000	37000	45000	55000	75000	90000	100000	110000	132000	160000	200000
Nominal voltage [V]	59	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Nominal current [A]	151	21,5	28,5	35	41,5	56	68	81	100	136	160	177	198	235	280	340
Magnetizing current [A]	355	13,2	15,66	18,2	20,34	26,32	30,6	34	45,7	59,16	67,04	71,685	76,626	87,34	99,96	119,68
Nominal revolutions [1/min]	356	1460	1460	1465	1465	1465	1475	1475	1480	1485	1485	1486	1488	1488	1486	1486
Time constant MT [s]	79	0,33	0,38	0,4	0,428	0,445	0,462	0,48	0,52	0,66	0,75	0,8	0,86	0,95	1,13	1,36
Stator resistance [mΩ]	345	607,25	455	438	389	312	225	122	80	72	65	51	48	38,3	22	16
Rotor resistance [mΩ]	439	461,51	345,8	332,88	295,64	237,12	171	92,72	60,8	54,72	49,4	38,76	36,48	29,108	16,72	12,16
Leakage inductance [mH]	440	6	3	2,2	1,8	1,2	1,1	0,8	0,8	1	1,2	0,6	0,8	1,1	0,8	0,4
Mutual inductance [mH]	441	154	77	72,8	60,4	53,8	46,9	39,2	37,4	30	25,8	23,9	23	18,4	17	13,6
Inertia moment [kg m2]	442	0,04	0,052	0,099	0,117	0,191	0,374	0,447	0,688	1,19	1,39	1,63	1,94	2,31	2,88	3,46
Max. mot. current [A]	5	32,25	42,75	52,5	62,25	84	102	121,5	150	204	240	265,5	297	352,5	420	510
Max. regen. current [A]	549	32,25	42,75	52,5	62,25	84	102	121,5	150	204	240	265,5	297	352,5	420	510
STC Current [A]	163	20,425	27,075	33,25	39,425	53,2	64,6	76,95	95	129,2	152	168,15	188,1	223,25	266	323
Starting voltage of the V/f curve [%]	90	2,71	2,52	2,35	2,1	1,8	1,6	1,45	1,1	1,1	1,1	1,1	1,05	1,2	1	1
Max. torque [Nm]	481	140	200	240	284	388	482	586	710	968	1162	1288	1414	1698	2060	2560

8.3 Motor control modes

Frequency converters UNIFREM 400 can be operated in these basic control modes:

Parameter ID: 451
SETTINGS –> CONTROL AND REGULATION –> CONTROL METHOD –> Motor control method

V/f open - *V/f control (scalar) without the speed feedback. Less accurate slip compensation. High stability and robustness of the control. Suitable for pumps, fans, conveyors and low momentum applications.*
V/f closed - *V/f control (scalar) with the speed feedback from the motor rotation speed (IRC sensor). Accurate slip compensation with a higher control quality, mainly in low speed. Suitable for applications with lower requirements for the dynamics of regulation.*
VIM closed - *Dynamic vector motor control with the rotation feedback designed for induction motor, at which the FLUX and the TORQUE of the motor are controlled using the motor mathematical model. For high-demanding applications where fast and exact control of torque and speed is required, e.g. CNC machines, lift, elevators, traction drives.*
VIM open. - *Dynamic vector motor control without the rotation feedback designed for induction motor. Current motor speed is evaluated from the mathematical model. This control is of worse quality around the zero frequency area, and because of this not suitable for applications where the motor has to hold the desired rotation speed in the zero area under the maximal load.*
V-SMPM - *Dynamic vector motor control with the rotation feedback designed for synchronous motors, at which the FLUX and the TORQUE of the motor are controlled using the motor mathematical model. For applications, where quick and accurate control of the motor speed and torque are required. Requires special rotor position sensor types!*

In the next section, we will focus mainly to functions designed for **V / F control.**

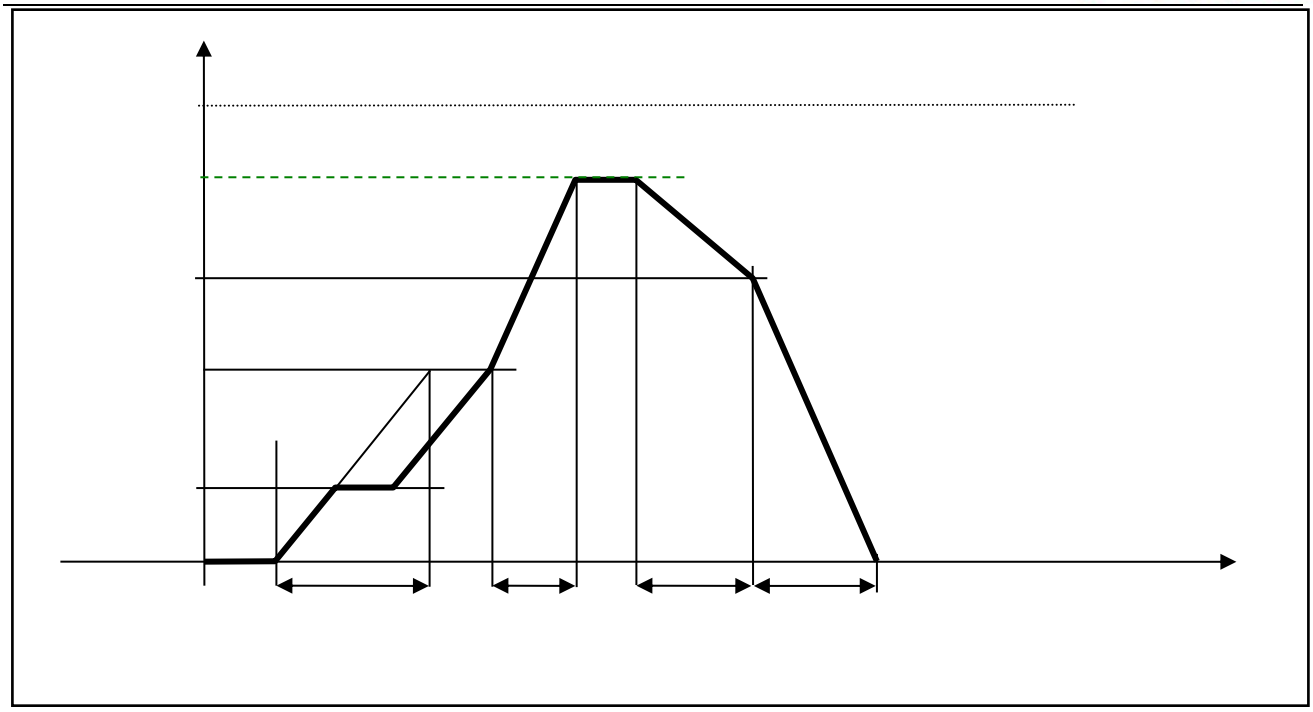
8.3.1 V/f control

FREQUENCY RAMPS

Converter can use flexible ramp functions which ensure smooth transitions between different frequency setpoint values to prevent sudden step changes of the output frequency during motor control. Allowed ranges of changes of frequency (min., max.), ramp break - points and also times of the respective sections can be set by parameters of ramp functions. By using these parameters, it is possible to adapt the dynamic comfort of the drive for a specific application.

Parameters to accommodate the acceleration and deceleration ramps are in the following group:

Parameter ID: 106
SETTINGS –> CONTROL AND REGULATION –> FREQUENCY RAMPS

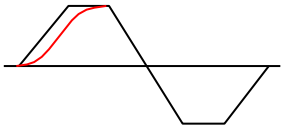
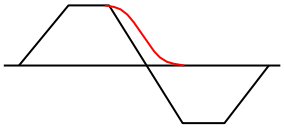
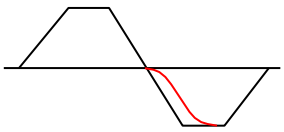


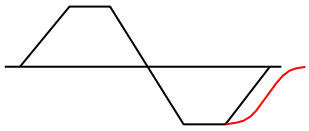
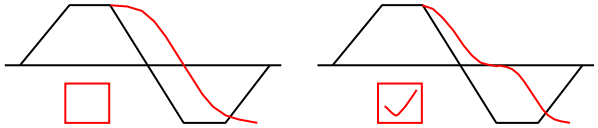
S-CURVE

If there is a demand that the acceleration should not change too quickly, it is suitable to use a S-curve that ensures smooth acceleration changes (Frequency profile is curved in the shape of S). This is applicable to drives, where you need to minimize jerk and torque shocks during Start or Stop (e.g. passenger elevators, electric vehicles, etc.)

S-curve operation mode can be configured and modified using the parameter:

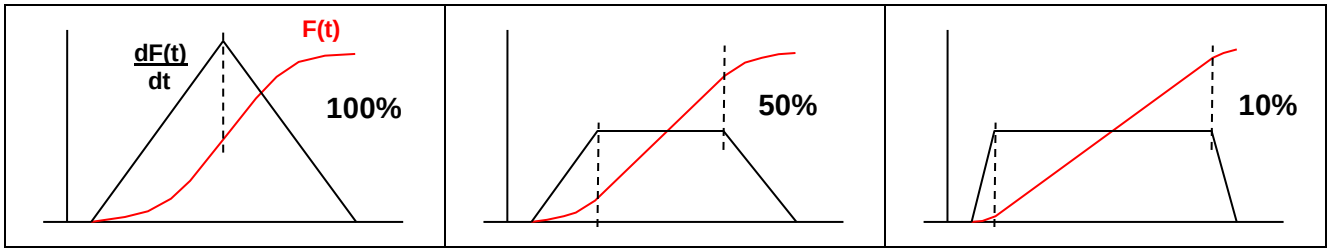
Parameter ID: 874
SETTINGS –> CONTROL AND REGULATION –> FREQUENCY RAMPS –> S-CURVE –> S-curve mode

Enabling of the S-curve	☐ ☑ enabling S-curves
S-krivka ramp-up + ☐	 ramp curve for positive ramp-up
S-curve ramp-down + ☐	 ramp curve for positive ramp-down
S-curve ramp-up - ☐	 ramp curve for negative ramp-up

S-curve ramp-down - ☐	 ramp curve for negative ramp-down
S splitting ☐	 zero crossing

Curve rate of the S-curve and its shape can be configured by using the parameter:

Parameter ID: 873
SETTINGS –> CONTROL AND REGULATION –> FREQUENCY RAMPS –> S-CURVE –>S-curve curvature



8.3.2 V/f curve

The main feature of the V/f control is that with increasing frequency of the output voltage, value of this voltage on the converter output increases proportionally until maximal value limit (saturation) is reached. The condition of induction motor constant flux is achieved by maintaining a constant ratio of **V** (voltage) / **f** (frequency).

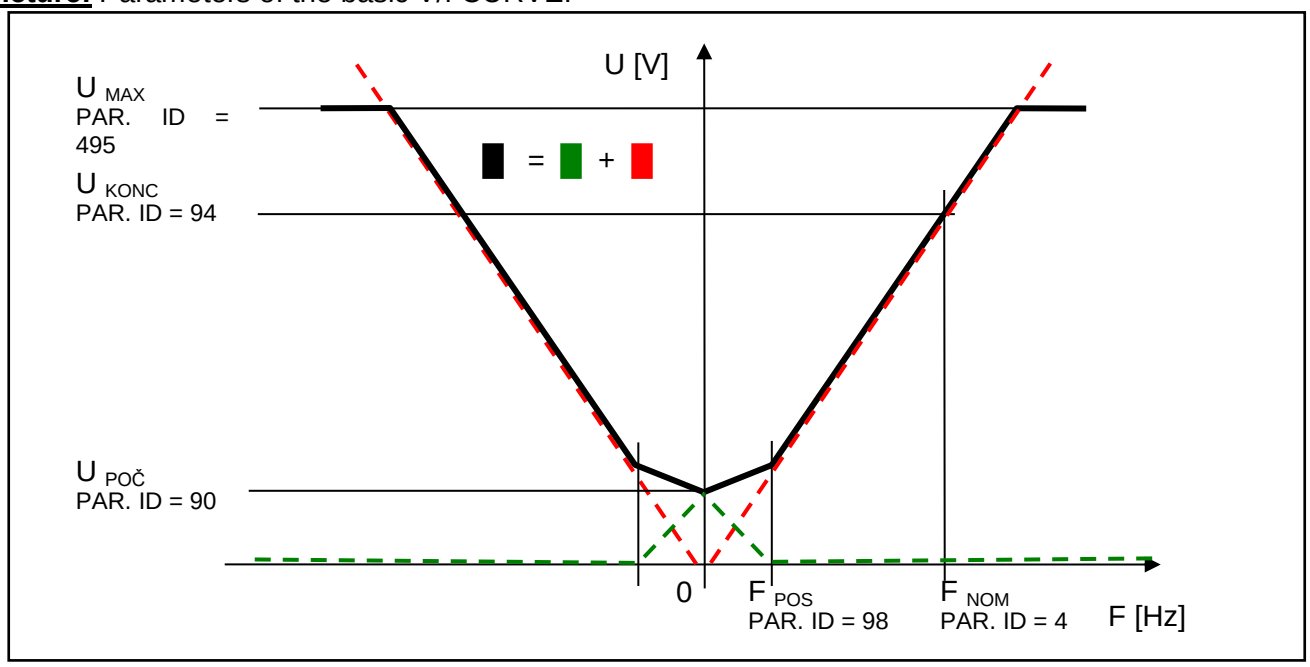
The basis for voltage generation in scalar control mode (V/f control) is the basic V/f curve, whose parameters are:

Parameter ID: 382
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> V/f curve

Parameters of the basic V/f curve:

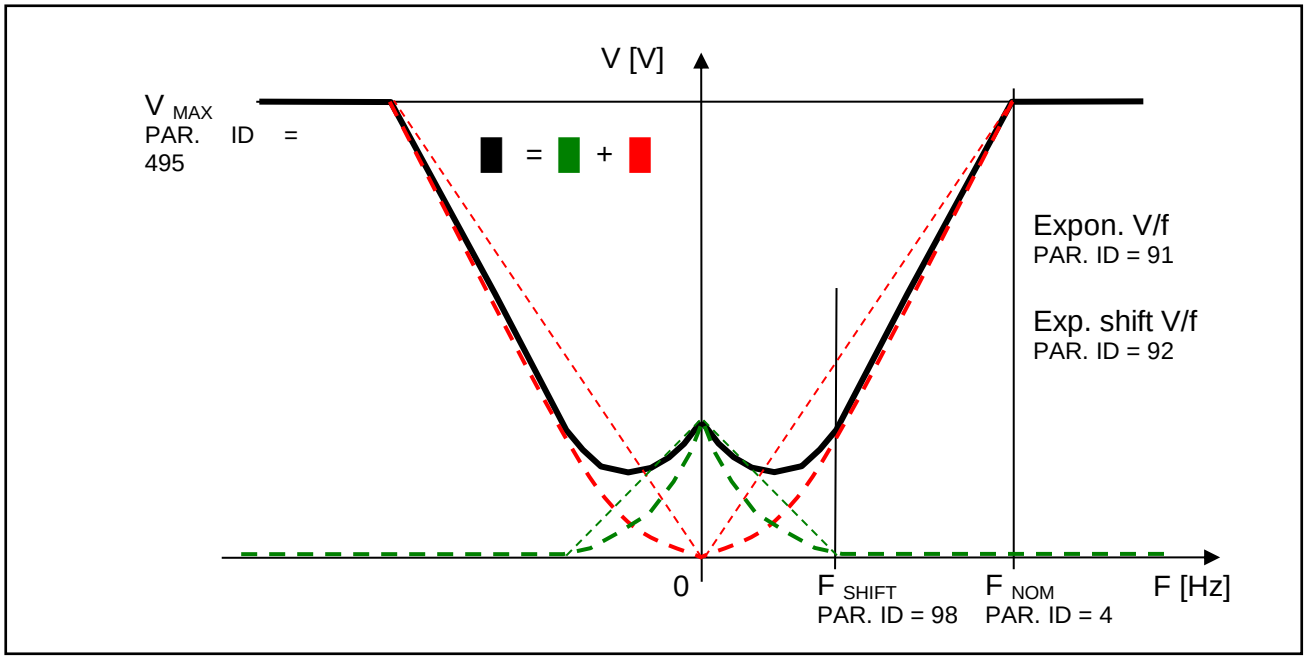
Parameter name	ID	Description
V/f Type	**347**	V/f Curve type. Selecting the features of the V/f control method operation.
Starting voltage [%]	**90**	Starting voltage of the V/f curve and minimum limit of the output voltage which corresponds the percentage value of the nominal load voltage.
End voltage [%]	**94**	End voltage of the V/f curve which corresponds the percentage value of the nominal load voltage.
Frequency shift [Hz]	**98**	Frequency shift of the V/f curve.
V/f Exponent [ ]	**91**	V/f curve exponent.
Exp. shift V/f	**92**	V/f curve shift exponent in the range from 0 Hz to Freq. shift.

Picture: Parameters of the basic V/f CURVE:



Curvature of the static V/f curve can be used for loads with a soft torque characteristics (pumps, fans) to ensure power saving motor operation on low rotation speed or to ensure a soft torque characteristics in the low rotation speed area. Smoothing of curvature is achieved by setting the exponents for individual V/f CURVE sections.

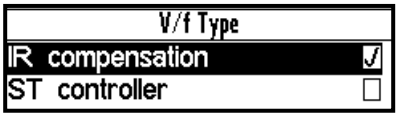
Picture: Curvatures (exponents) V/f CURVE:



Basic V/f curve is a well-known and simple tool to configure the motor control.

8.3.3 IR compensation

This function can be turned on by the parameter **„V/f Type (ID 347) = IR compensation“.**



MENU \ SETTINGS \ CONTROL AND REGULATION\ V/f CONTROL \ V/f CURVE \ **V/f Type -> IR compensation**

The value of the output voltage is automatically corrected during active IR compensation according to the load of the drive and operating conditions. So the voltage drop in the stator windings of motor is compensated and constant motor excitation is ensured. In practice, in the motoric operation mode the voltage increases and in regenerative operation mode the voltage decreases.

Mathematical model, which is the core of IR Compensation does not reach high accuracy near zero speed, thus it is necessary to adjust the frequency from which the correction starts to apply. As a rule of thumb, it is usually 0.5 to 3 Hz. The output of correction is filtered with adjustable filter.

IR Compensation parameters:

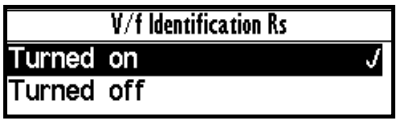
Parameter name	ID	Description
IRC Filter	**523**	Time constant of the filter applied to the output of the IR compensation function.
IRC Frequency	**795**	Upper limit of the output frequency, in which the IR compensation is suppressed.

Prerequisite for the successful deployment of **IR Compensation** is the correct value of nominal motor parameter - Stator resistance [345].

Parameter ID: 345
SETTINGS –> MOTOR -> SPECIAL PARAMETERS -> Stator resistance [mΩ]

A good source for getting the value of this parameter is the MOTOR MACRO of the same or at least of the nearest power. From this preset value, converter will determine the exact value with automatic identification of the stator resistance, which can be turned on by the following parameter:

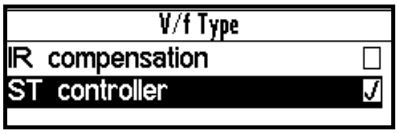
Parameter ID: 383
SETTINGS –> MOTOR -> SPECIAL PARAMETERS -> V/f Identification RS = Turned on



Stator resistance identification is then performed always whenever the drive is started or at at zero speed operation. This can cause drive response delay to the Start motor command (ramp freeze untilthe resistance value settling). This condition is indicated by warning message of converter. If such behavior of the drive is unacceptable due to the operating conditions (cranes, production lines, traction ...), it is neccesary to turn off identification of RS after drive tuning.

8.3.4 Starting Torque Controller (STC)

This function can be turned on in the parameter „ V/f Type (ID 347) = ST controller “.



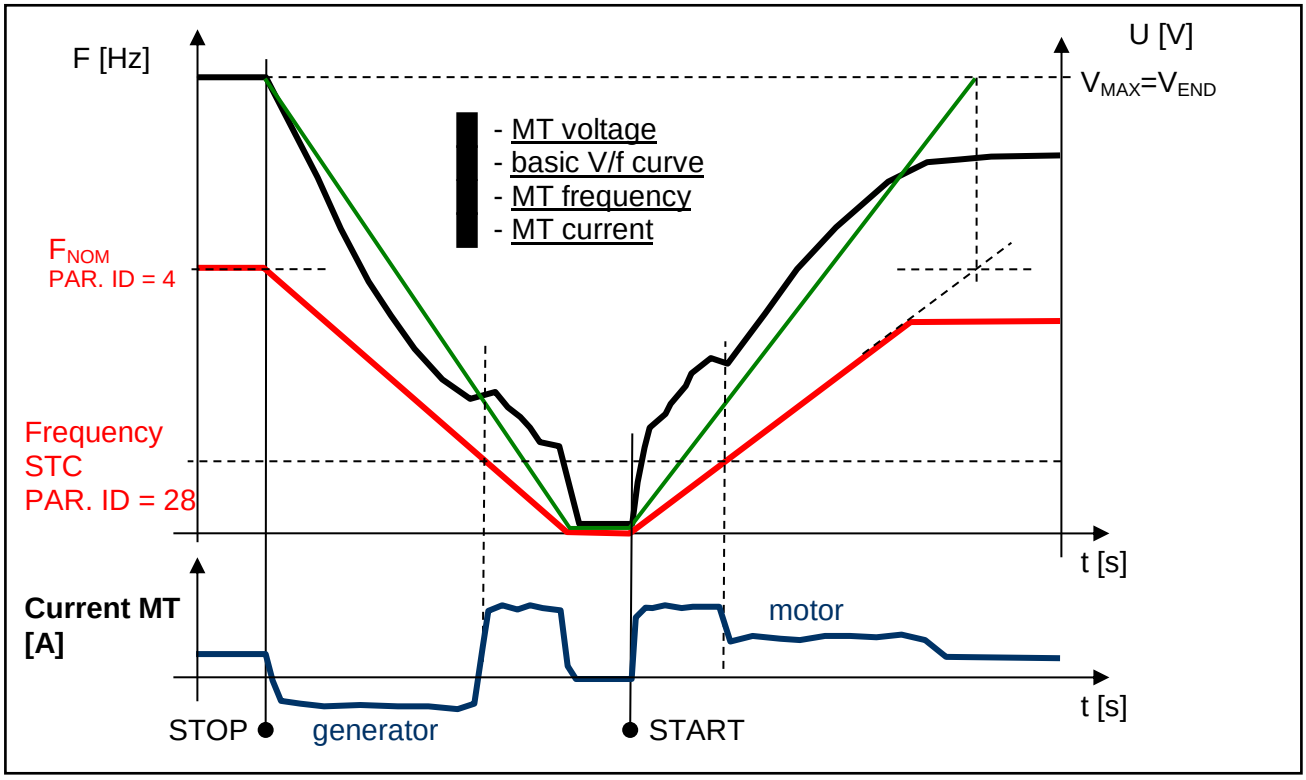
MENU \ SETTINGS \ CONTROL AND REGULATION \

During activity of starting torque controller in preset frequency range, converter achieves motor excitation increase to the desired starting (engaging) current by lifting V / f curve above the basic values of V/f curve. Required dynamics of this controller must be set.

Starting Torque Controller parameters:

Parameter name	ID	Description
STC Current	**163**	Setpoint value of the starting torque current.
Frequency STC	**28**	Upper limit of the frequency area, where the starting torque controller (STC) is active.
STC Dynamics	**26**	Setting the ST controller dynamics.

Picture: V/f curve modes on the drive with a high moment of inertia.



8.3.5 Slip compensation

Slip is the side effect of asynchronous motors operation, which means lagging / overtaking the rotor against the stator due to load. Slip as the difference of stator and rotor frequency is dependent on many factors. UNIFREM converters evaluate motor slip (slip compensation function is activated) and slip is added to the stator frequency setpoint.

Parameter ID: 349
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> SLIP COMPENSATION -> Slip compensation = turned on

Slip compensation
turned off
turned on ✓

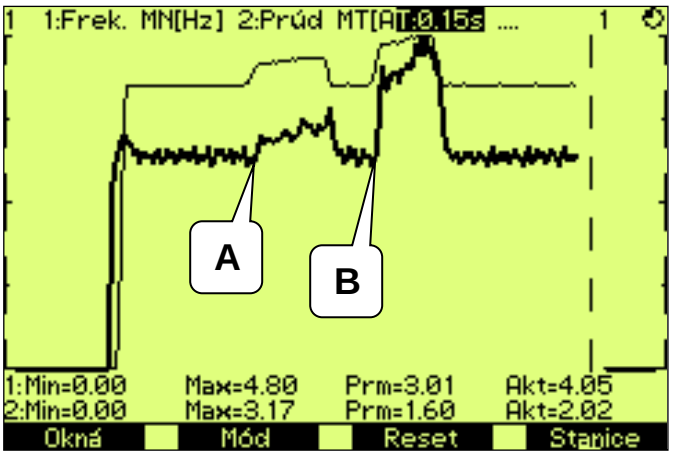
Motor slip compensation effect: Rotor speed will maintain the value near to the setpoint value at load changes. Moreover, it greatly increases the torque capability of the motor at low speeds.

The main parameter to tune the rate of slip compensation is the gain in the parameter.

Parameter ID: 350
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> SLIP COMPENSATION -> Slip comp. Gain

Example: Slip compensation activity on the real drive

(thin line – stator frequency, thick line – motor current).



A. – a small load increase caused a small slip compensation.

B. – greater load increase caused greater slip compensation.

Model of slip for its correct operation requires proper values of motor parameter.

Parameter name	ID	Description
Nom. power [W]	**357**	Necessary to calculate the nominal slip.
Nom. frequency [Hz]	**4**	
Nom. revolutions [rpm]	**356**	
Stator resistance [mΩ]	**345**	The same conditions as for IR compensation

Slip is compensated exactly by the actual slip assessed on the difference of the stator and rotor frequency in V/f (scalar) closed control.

Parameter ID: 193
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> SLIP COMPENSATION -> Slip restriction = turned on

Slip restriction
turned off
turned on ✓

When this mode is enabled, converter will adjust the setpoint frequency so as not to exceed the maximum allowable slip from parameter Maximal slip [Hz] [177]:

Parameter ID: 177
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> SLIP COMPENSATION -> Maximal slip [Hz]

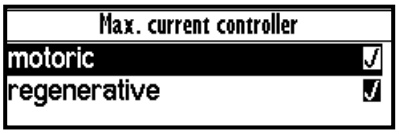
"W40-Slip restriction" warning message is generated. This state is ended after declining load on the motor and stator frequency increasing is allowed.

8.4 Maximal current controller (MCC)

Maximal current controller is a standard function of UNIFREM 400 converters, and its function is to restrict output current into the motor by correcting the output frequency. Function, as well as the controller itself, are activated in the parameter:

Parameter ID: 352
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> MAX. CURRENT CONTROLLER (MCC) -> Max.current contr. = motoric or = regenerative

The controller operates in motoric and regenerative operating mode.



Frequency is decreased in motoric operating mode and increased in regenerative operating mode if current treshold is reached.

Current limit for the motor operation.

Parameter ID: 5
SETTINGS –> CONTROL AND REGULATION –> MAX. CURRENT CONTR. (MCC) –> Max. mot. current M. [A]

Current limit for the regenerative operation.

Parameter ID: 549
SETTINGS –> CONTROL AND REGULATION –> MAX. CURRENT CONTR. (MCC) –> Max. regen. current [A]

In specific cases, converter can adjust the restriction value according to the another criterias.

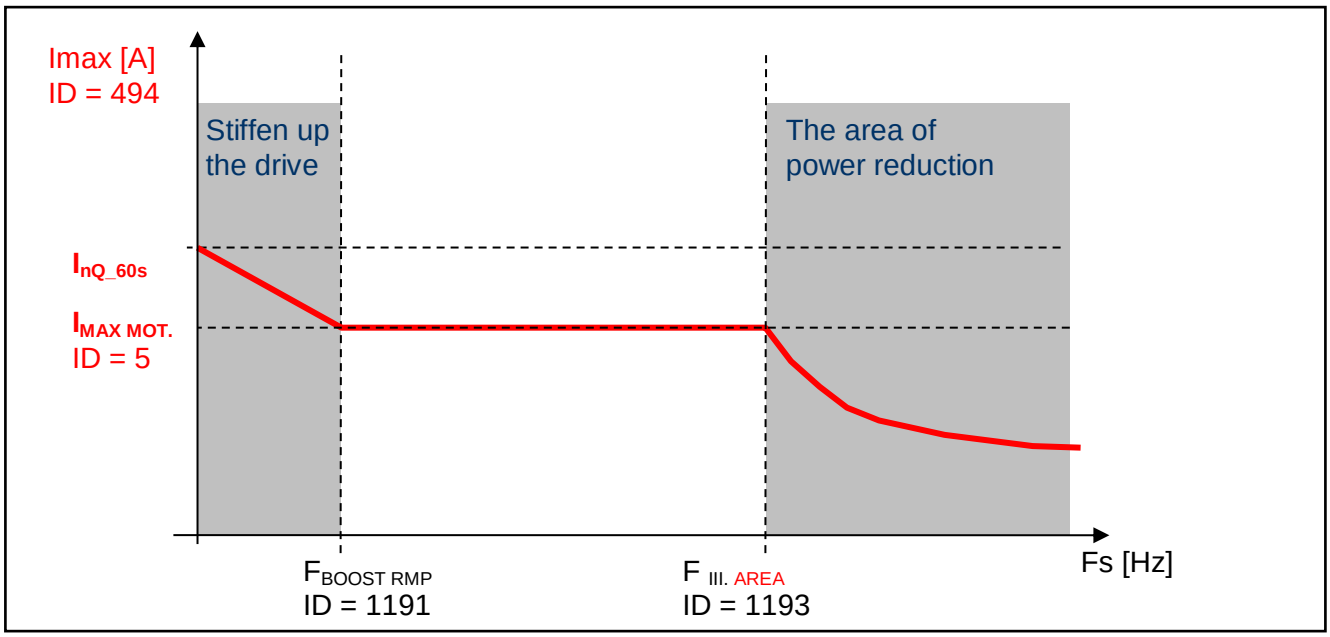
At low frequencies, the current restriction increases to the permissible overload limit in order to achieve a higher starting torque. At high frequencies the current restriction decreases to prevent motor operation in unstable part of the torque characteristics (area of power derating).

Furthermore, the „Power restriction" function can reduce the current restriction, if its conditions are met, such as high thermal integral of converter, high cooler temperature or if the conditions of power restriction are met when selecting parameter: PR Signal [1088] (signal the power is restricted according to).

The current value of the motoric restriction of the current is signalised by the diagnostic value:

Parameter ID: 494
DIAGNOSTICS –> Control –> Additional values –> Max. current [A]

Picture: Image: Specific cases of maximum current limit adjustment



WARNING!

In case, that the motor is loaded constantly in regenerative mode, the MCC is active and the STOP command is received, the situation can happen that the rotation speed will not decrease and the drive will not be turned off. In this case, it is necessary to increase the value of the maximal regenerative current or generate the RESET command or interrupt the safety(emergency) input.

Parameters of the controller (P, I and D) influence the speed, the converter can restrict current with and prevent undesired current increase over allowed limit.

Parameter ID: 353
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> MAX. CURRENT CONTROLLER (MCC) -> P component of the MCC [ ]

Parameter ID: 354
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> MAX. CURRENT CONTROLLER (MCC) -> I component of the MCC [ms ÷ s]
Parameter ID: 1047
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> MAX. CURRENT CONTROLLER (MCC) -> D component of the MCC [ ]

MCC restricts the slope of frequency increase or decrease by ramps, but it can also take up during steady speed, when the current exceeds configured limits. If the frequency correction reaches frequency limit Fmin [110] or Fmax [112], it will not longer correct the frequency which will be affecting the current increase and then "Overcurrent" or "Converter overload" faults are possible.
Fast correction of the starting voltage based on excessive current can be turned on to speed up the the MCC reaction and to improve operation in the low frequency range. The gain is adjusted by following parameter:

Parameter ID: 799
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL-> MAX. CURRENT CONTROLLER (MCC)-> MCC Gain [ ]

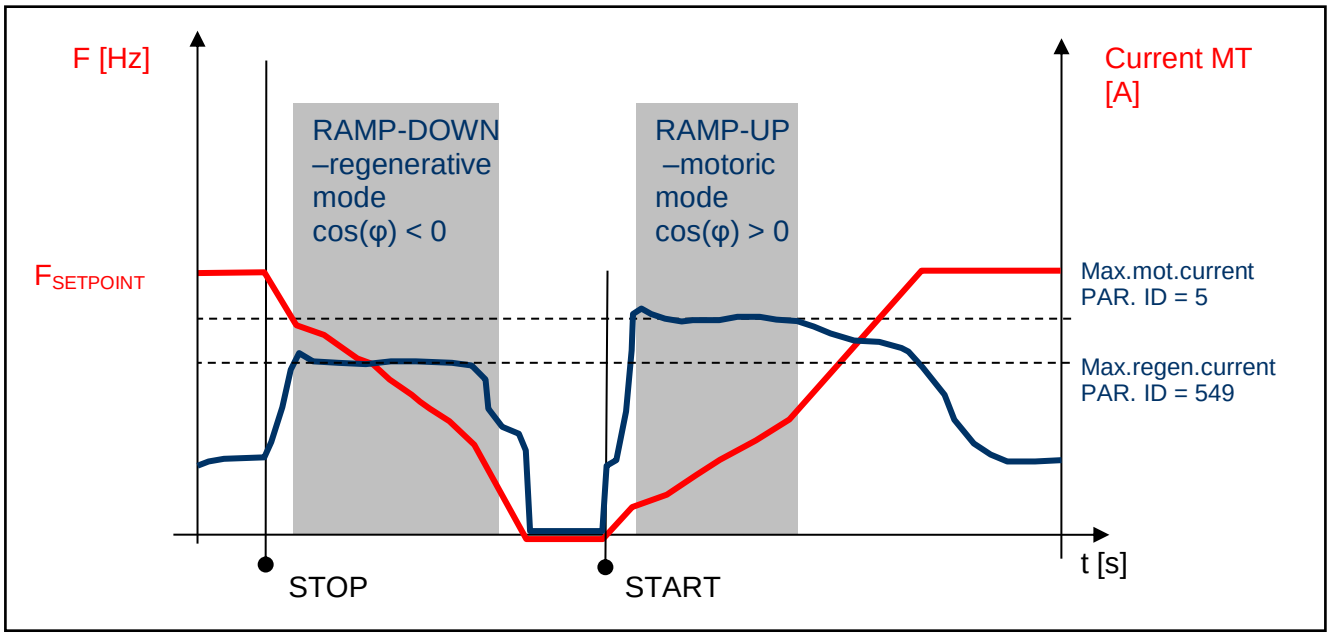
This parameter serves to set the voltage and frequency correction of MCC:

Parameter ID: 1191
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> MAX. CURRENT CONTROLLER (MCC) -> Freq. boost. MCC [ ]

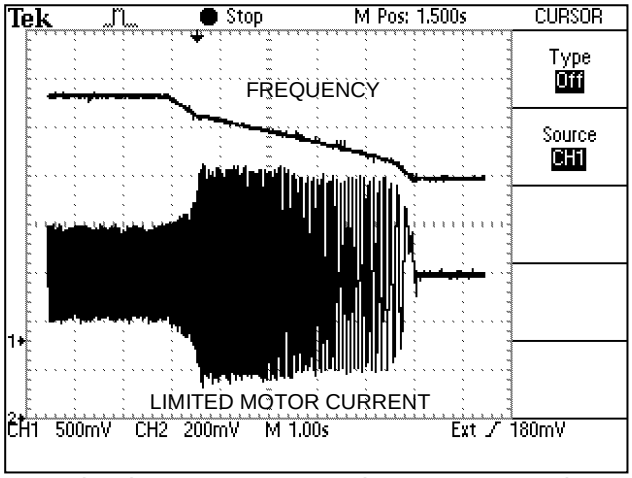
Scalar (V/f) drive with current limit can be tuned by using these two parameters in order to satisfy maximal current and to keep the frequency not too low, to prevent torque lose (See. stiffen up the drive in the previous picture).

Current restriction may cooperate with slip compensation and with compensation of IR in V / f curve, as well as with other converter functions. There is a category of drives, where it is not appropriate to use MCC. These are stroke or lift drives of cranes, elevators and conveyors, where current restricition could result in the weight fall or violation to ramp speed. Then drive at high current reports generally a fault.

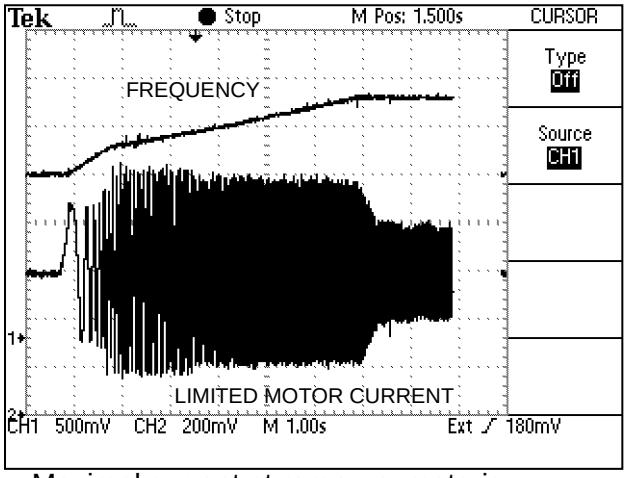
Picture: Typical current and frequency course when MCC takes up on a drive with a flywheel:



Example: Current limit (MCC) takes up on a real drive:



Maximal current at ramp-down, regenerative mode

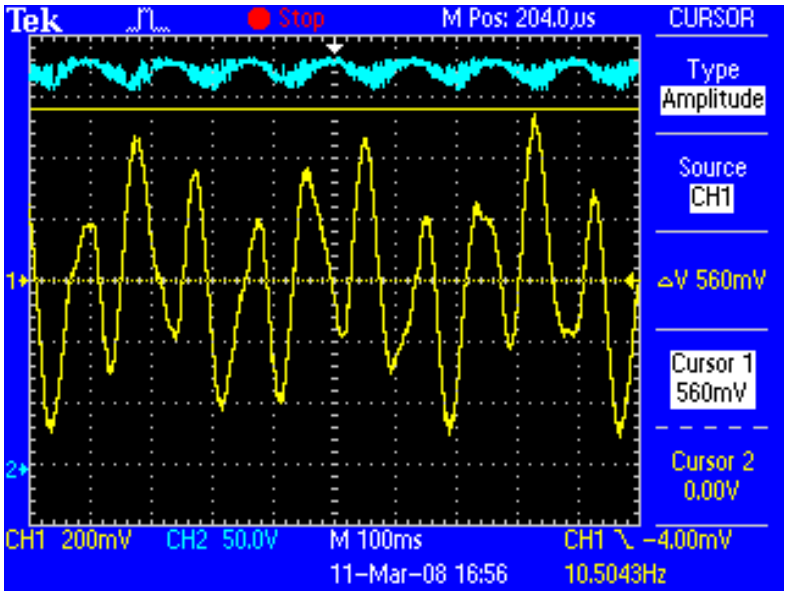


Maximal current at ramp-up, motoric

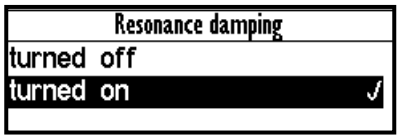
8.5 Resonance damping

Motor resonance is a phenomenon, when motor fed by the converter is vibrating and periodically moving between regenerative and motoric operating mode caused by the influence of inhomogenity of air gap or load non-.
The period of these oscillations is usually only a few periods of the stator frequency. Resonance results in a vibration of mechanical parts, increasing their stress and vibration in the DC link voltage, motor current, and subsequent failures.

Example: Resonant oscillations are measured on a traction drive (sky-blue – DC link voltage, yellow – current in one of motor phases)



Resonance damping function can be turned on and off by parameter:

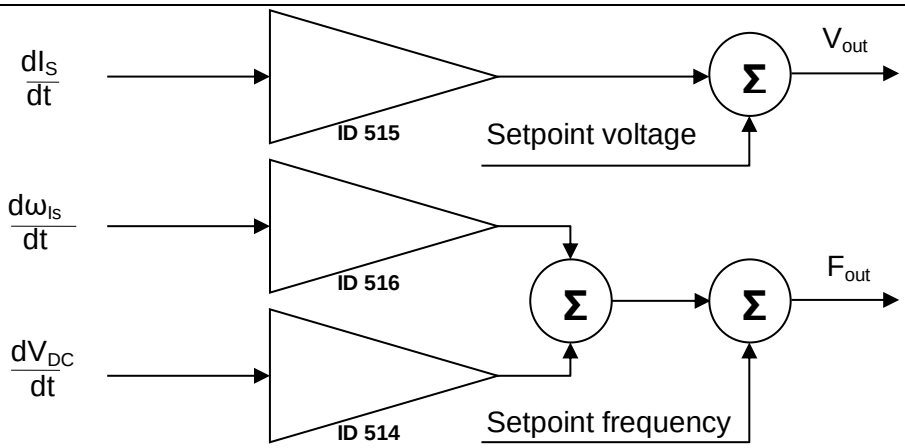


Parameter ID: 513
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> RESONANCE DAMPING -> Resonance damping = turn on

To adjust the damping, three coefficients that govern the degree of influence of selected process variables on the output frequency and voltage are used. Oscillations amplitude can be reduced or even completely removed by suitable tuning of these parameters.

Parameter ID: 514 **Setting the resonance damping gain of the derivative DC voltage resonance**
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> RESONANCE DAMPING -> Effect from the **dVdc** [ ]
Parameter ID: 515 **Setting the resonance damping gain of the derivative stator current model.**
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> RESONANCE DAMPING -> Effect from the **dIs** [ ]
Parameter ID: 516 **Setting the resonance damping gain from the stator current frequency change.**
SETTINGS –> CONTROL AND REGULATION –> V/f CONTROL -> RESONANCE DAMPING -> Effect from the **dwIs** [ ]

Picture: Importance of function coefficients „Resonance damping“:



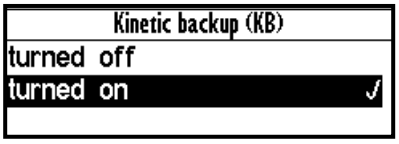
Resonance damping can reduce or completely suppress undesired motor vibration, especially if there is a small load operation.

8.6 Voltage controller (VC) - Dynamic deceleration (DD) a Kinetic backup (KB).

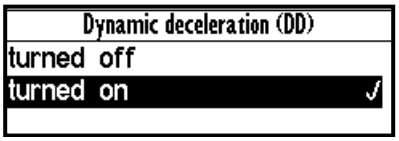
DC-link voltage (V_{DC}) is the one of the most important parameters of frequency converter.
Its value is equal to the peak value of the rectified AC phase to phase voltage (U_{DC} = 1.414 * U_{UV}) under normal conditions. For 400V power supply network this value is around 565V. DC link voltage can therefore vary with the grid voltage. If motor is under load at large voltage drop of power supply network, motor will not get enough voltage, which causes its deexcitation, slip and load current increasing. It is necessary to reduce the frequency to a value when there is sufficient voltage on motor at lower grid voltage, if we want to prevent overheating of the motor and converter or unwanted fault "Overcurrent". Block **"Voltage controller"** and its part **kinetic backup controller (KBC)** are made for these cases in UNIFREM 400 XXX frequency converters. Among other things, it also serves to bypass short-term supply network outages, when the required minimum voltage U_{DC} is maintained with controlled setpoint frequency reduction and by mass inertia braking.
V_{DC} voltage rises due to spillover of the energy from the motor back to the converter during motor braking, thus at ramp-down or under the influence of external forces to the motor. In this case the converter has sufficient voltage to correct motor control, but the voltage stress of the power components increases and there is risk of "overvoltage" fault. Braking resistors and modules that convert the excess energy into the heat are generally used to limit the V_{DC} at drives, where motor works mainly in the regenerative operation mode (strokes of cranes, lifts, rapid ramp-up / ramp-down of inertia). It is possible to use the second part of the section **"Voltage controller" - Dynamic deceleration controller (DDC**), where it is not strictly prescribed the stopping time of the drive. Dynamic deceleration controller will stop growth of the DC voltage with the setpoint frequency increasing. Controller will stop to correct it at the frequency maximum and will allow voltage increasing to the fault level (the same is true even in current limit - MCC).

Each part of the **Voltage controller** can be independently turned on / off by parameters:

Parameter ID: 748
SETTINGS –> CONTROL AND REGULATION –> VOLTAGE CONTROLLER (VC) -> Kinetic backup (KB)



Parameter ID: 749
SETTINGS –> CONTROL AND REGULATION –> VOLTAGE CONTROLLER (VC) -> Dynamic deceleration (DD)



The important parameters of voltage controller are reference values of DC link at which the function of the kinetic backup and dynamic deceleration is activated.

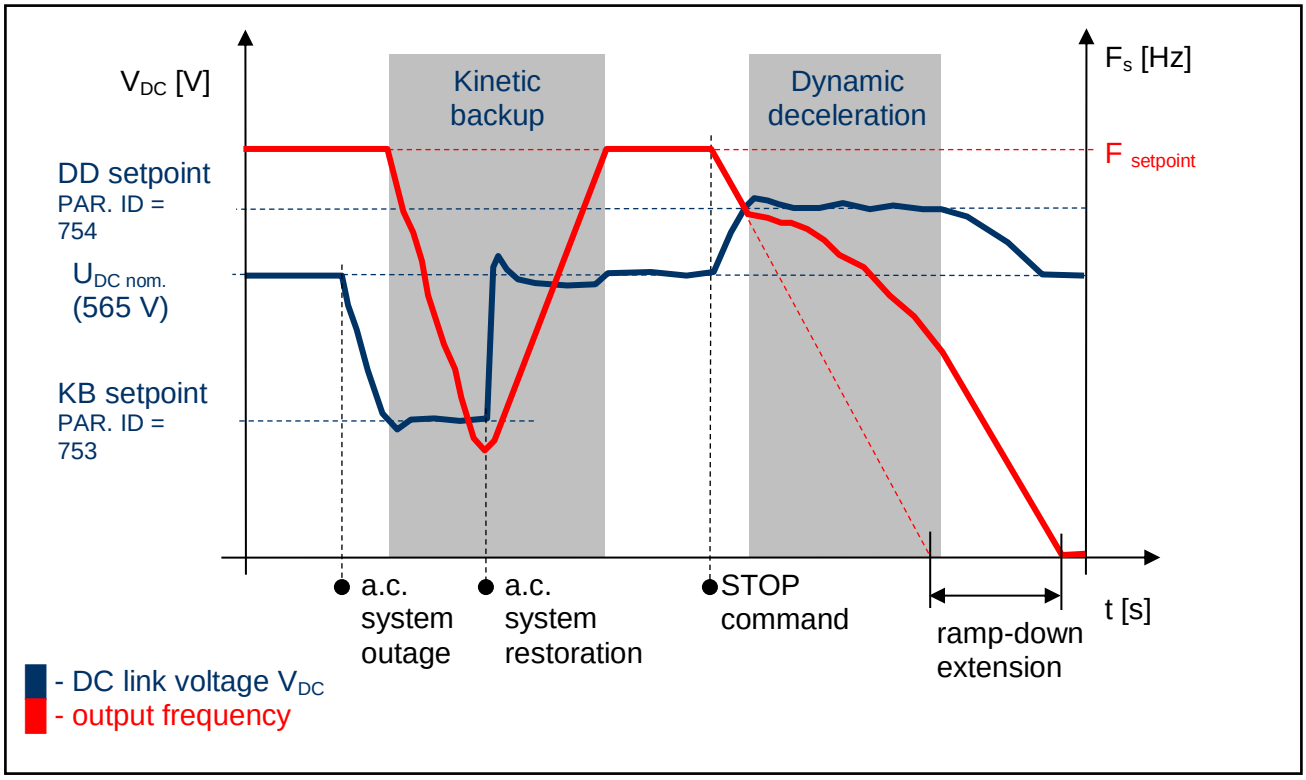
Parameter ID: 753
SETTINGS –> CONTROL AND REGULATION –> VOLTAGE CONTROLLER (VC) -> KB setpoint

Parameter ID: 754
SETTINGS –> CONTROL AND REGULATION –> VOLTAGE CONTROLLER (VC) -> DD setpoint

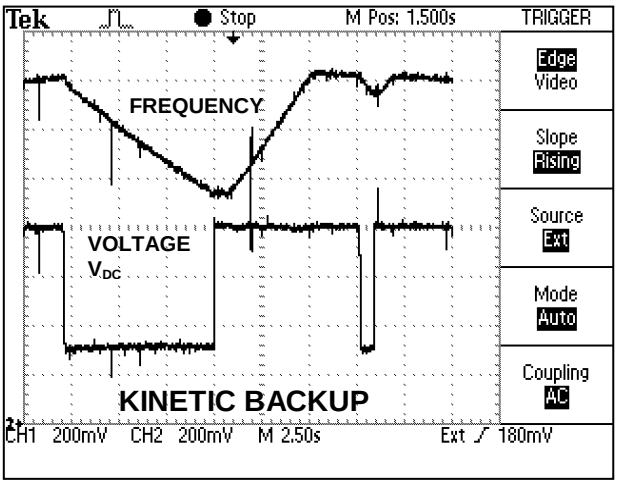
Voltage controller components P, I and D, which together affect the KBC and DDC are used to adjust the dynamic of response and possible tuning of voltage overshoot or to stabilize the oscillating waveform.

Parameter ID: 751
SETTINGS –> CONTROL AND REGULATION –> VOLTAGE CONTROLLER (VC) -> P gain VC
Parameter ID: 752
SETTINGS –> CONTROL AND REGULATION –> VOLTAGE CONTROLLER (VC) -> I gain VC
Parameter ID: 750
SETTINGS –> CONTROL AND REGULATION –> VOLTAGE CONTROLLER (VC) -> D gain VC

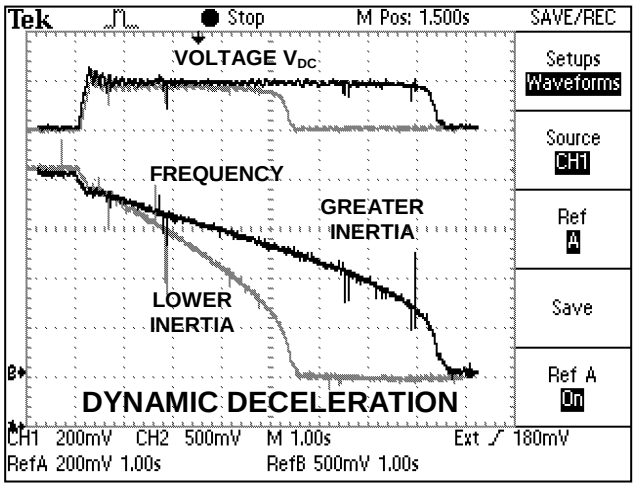
Picture: Voltage controller (VR) - principle of operation:



Example: Measurement results of VC deployment on the drive with flywheel.



Kinetic backup of converter at power supply voltage failure on the motor with flywheel.



Dynamic deceleration at different inertias of the drive.

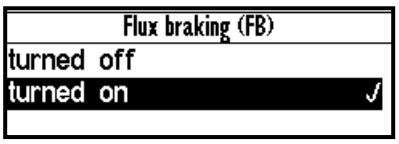
In many industrial applications of the drives with frequency converters it is required to stop the drive in the shortest time. This significantly reduces the cycle time of repeated working cycles and has a direct impact on production productivity. In addition, if it is a drive, where moment of inertia and loading ratios are variable, fixed time of ramp-down setting can be problem. Then is necessary to apply dynamic deceleration mode. For example, spin-driers, mills, blenders, where inertia depends on the amount of processed material.

8.7 Flux braking

Several braking modes can be used in frequency converters. Mainly it is the use of a braking module and a braking resistor. However, there are drives, where braking conditions occur partly and not often. For example, if it is needed to stop the pump in 10 seconds, but during the ramp-down an "Overvoltage" fault occurs, it is not necessary to use the braking module. If for example 13 or 15 second long ramp-down ends without a fault, the amount of generated energy can be decreased by using the **Flux braking function.**

To activate the function - flux braking use this parameter:

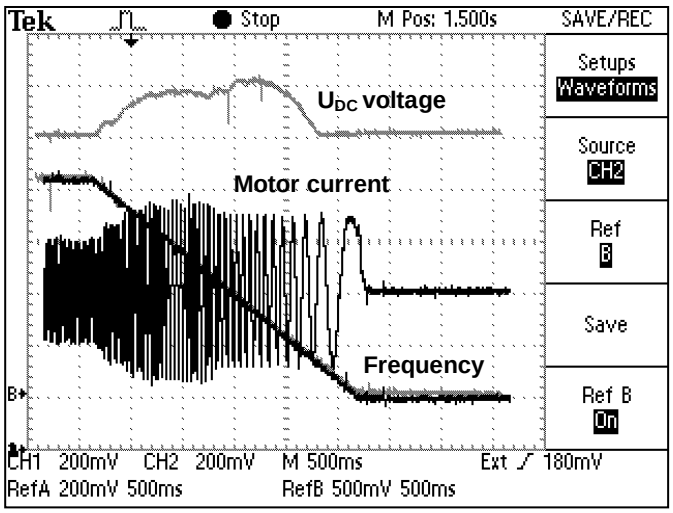
Parameter ID: 775
SETTINGS –> CONTROL AND REGULATION -> FLUX BRAKING -> Flux braking (FB)



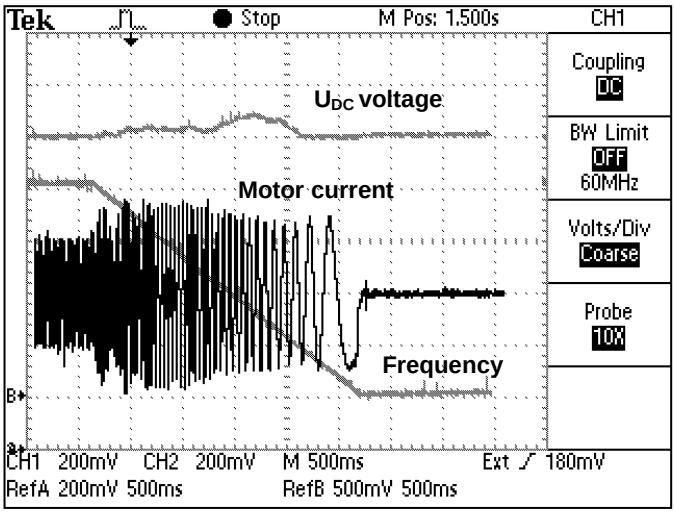
It works as follows: the converter starts to increase the motor voltage after exceeding the "FB working voltage", and excitation (flux) is increased. This causes that a part of the energy is not flowing from the motor to the converter, but it is transformed to heat in the motor coil. Increasing the flux braking rate is possible by using the parameter "Flux braking gain [777]".

Parameter ID: 776
SETTINGS –> COTROL AND REGULATION ->FLUX BRAKING -> Operating voltage FB [V]
Parameter ID: 777
SETTINGS –> COTROL AND REGULATION ->FLUX BRAKING -> Flux braking gain [ ]

Example: Activity of flux braking on the real device



Flux braking at lower gain.



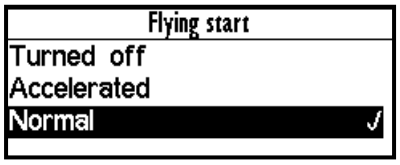
Flux braking at higher gain.

During flux braking, bigger motor overheating occurs, so it is necessary to provide sufficient thermal protection, thermistor or PT100, possibly forced cooling.

8.8 Flying start

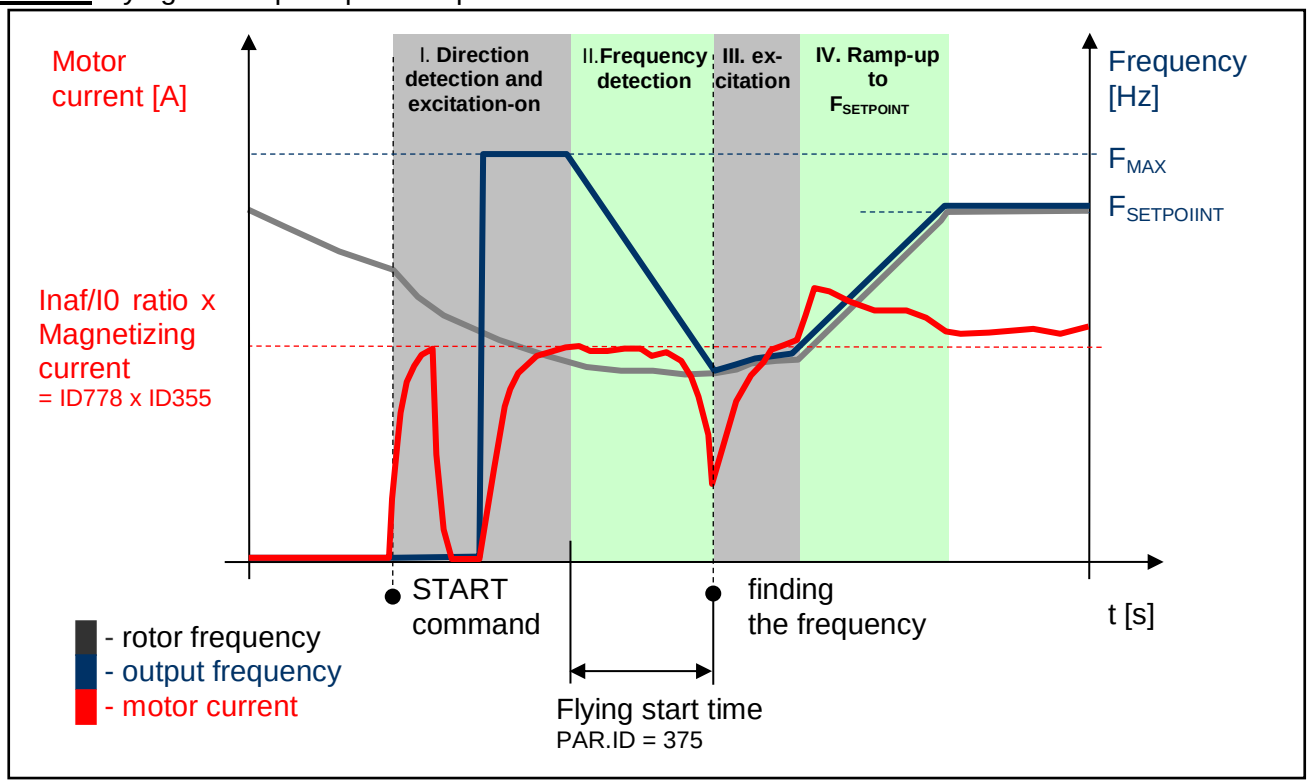
During the operation of electric drives there is often a situation, when you need to start control, even if the motor is rotating. For example: flue fan is rotating due to pressure difference, traction vehicle is in motion or generator of small hydropower plant is rotating. The most accurate and fastest process to do this is by using the speed sensor (encoder-IRC). Encoder gives precise information about the frequency of the machine and the converter is able to automatically adapt and phase-on. It is not necessary to use the sensor when using the function "Flying start" in the frequency converter UNIFREM 400 XXX. Flying start can be turned on by parameter:

Parameter ID: 374
SETTINGS –> CONTROL AND REGULATION –> FLYING START -> Flying start



It is a fully automatic function which carries out the process off flying start to the rotating motor (or generator) always after the START command activating. Flying start takes place in several stages and its duration may be variable from rotational speed, motor power as well as parameter settings.

Picture: Flying start – principles of operation:



Success of flying start and search time is dependent on the following parameters:

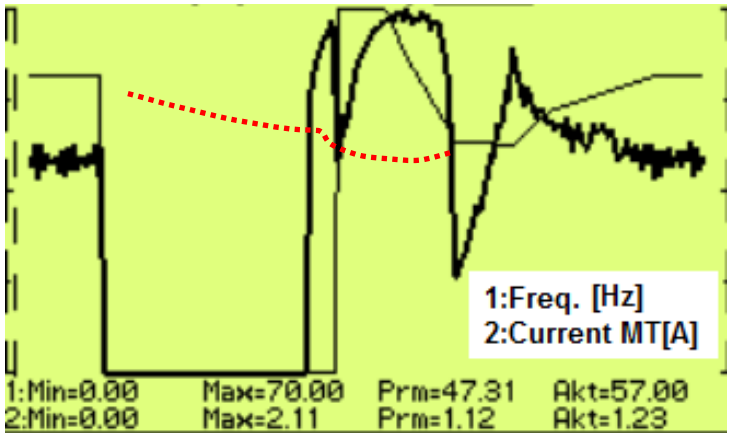
(Multiple of magnetization current – it affects the sensitivity of the flying start and intensity of rotor braking)

Parameter ID: 778
SETTINGS –> CONTROL AND REGULATION –> FLYING START -> Inaf/I0 Ratio [ ]

(Time constant MT – affects the speed of motor excitation)

Parameter ID: 79
SETTINGS –> MOTOR -> SPECIAL PARAMETERS -> Time constant MT [s]

Example: Flying start to rotating motor
(thin line - output frequency, thick line - motor current, red dotted line - the rotor frequency)



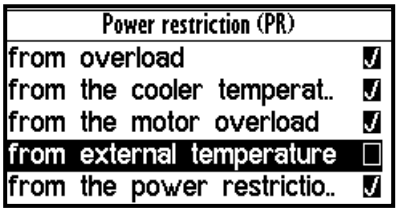
8.9 Power restriction

In a real environment, the need to keep the drive in operating mode even if the motor or the converter is overloaded can occur. Possible fault caused by overloading or overheating should cause outage of the technology, which could be worse than an eventual short term decrease of the motor power. Because of this, UNIFREM 400 XXX frequency converters have a power restriction functional block in their software equipment.

Power restriction function is configured in the parameter:

Parameter ID: 766
SETTINGS –> CONTROL AND REGULATION -> Power restriction [ ]

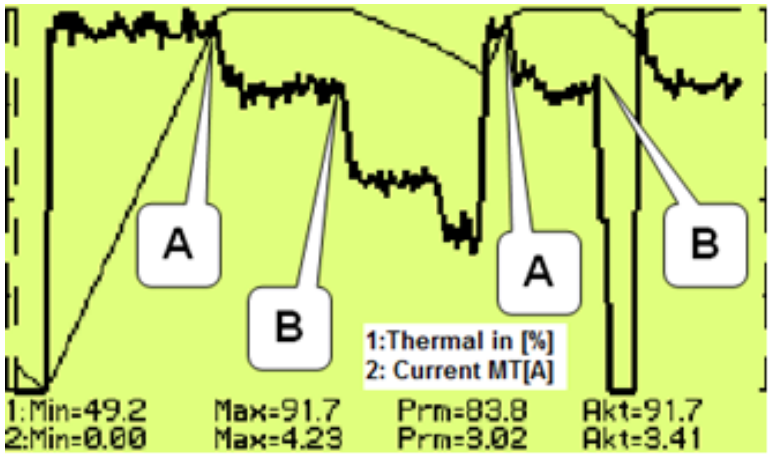
There it is possible to activate individual sources (causes) of the power restriction or their combinations:



From overload	Thermal integral INV (ID 31) > 90 %	Fault = 100 %
From cooler temp.	Cooler temp. (ID 74) > C_temp warning (ID 767)	Fault = 90 °C
From motor overload	Temp integral MT (ID 33) > 90 %	Fault = 100 %
From external temp.	ETP Temp. (ID 869) > ETP Warning (ID 865)	Fault = ID 866
From the power restriction signal	P[1088]) PR Signal beyond the value P[1089] PR signal limit.	

When warnings from the external thermal protection of the converter (motor) occur, power restriction is activated. Power restriction output is the correction of the maximal current so the corresponding displayed status values do not exceed fault level and converter operation does not stop. Power restriction is executed by restricting the maximal current. The maximal current controller (MCC) has to be activated and functional (ID 352).

Example: Power restriction operation from the converter overload of an undersized drive with an induction motor
(thin line - Thermal. integral. INV, thick line – Current MT).



A – Drive was running under full load, temperature integral of the converter reached 90% level and then restricted the current so the integral will not increase further.

B – Drive was relieved and the integral is decreasing. The drive is capable to generate maximal power again.

8.10 Optimization

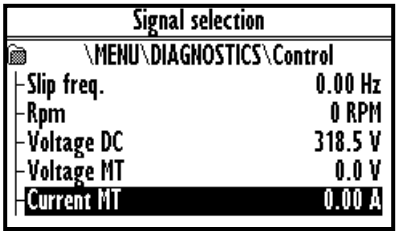
Optimization is an individual management and control block and its goal is to ensure searching and maintaining optimal values of any displayed value or parameter of the converter by using an input channel. Optimization has its own output, which operates in the interval 0.000 to 1.000 and it is possible to display it in the converter diagnostics:

Parameter ID: 423
DIAGNOSTICS –> Functions -> Optimization -> OPT Output [ ]

The optimization output connection to any entering channel is performed after selecting this parameter by selecting the signal (source) of the corresponding entering channel.

Value selection, which criteria should be searched by the optimization block is performed by parameter configuration:

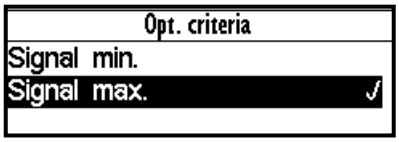
Parameter ID: 80
SETTINGS –> FUNCTIONS -> OPTIMIZATION -> Optimization signal



Motor current, motor power and motor torque are selected as the optimization signal in standard optimization tasks mostly. After selecting one of the analog inputs, it is possible to optimize any technological value.

Optimization criteria defines, if converter will search for the minimum or the maximum of the selected signal. For example on generator drive of hydro power-plant, if we want to maximize the produced power and minimalize the power losses on a pump drive.

To select the criteria, use the parameter:

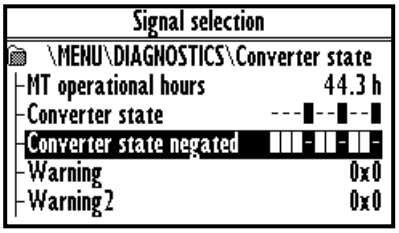


Parameter ID: 208
SETTINGS –> FUNCTIONS -> OPTIMIZATION -> Optimization criteria

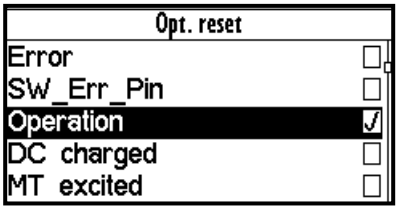
Blocking (reset) the optimization and measurement condition:

Two signals are in the OPTIMIZATION block, that control the optimization operation conditions and a condition, when it is possible to measure optimized values.
To configure the conditions for blocking and reseting the optimization, use the signal:

Parameter ID: 263
SETTINGS –> FUNCTIONS -> OPTIMIZATION -> Opt. Reset signal



For example: If the optimization is set to search for maximal or minimal power, it is necessary to block its operation when the device is turned off. Then the parameter „Opt. reset signal“ [263] is set to the value Converter status negated (negation of the status word) and the command Run (converter generates the output voltage) is set in the parameter „Opt. Reset“ [273] concurrently.

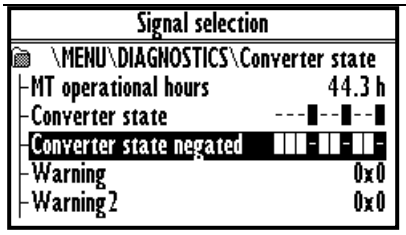


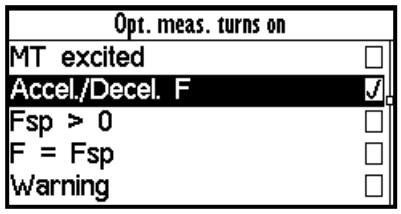
Since the status word is **negated**, it means that, optimization Reset is active when the converter does not generate the output voltage.

When the optimization output change causes transiting effects which duration period is variable, it is necessary to delay measuring optimization criteria. Signal from the following parameter is used to configure measurement conditions:

Parameter ID: 279
SETTINGS –> FUNCTIONS -> OPTIMIZATION -> Opt. meas. signal

If the measurement should be executed after the ramp function ends, in this signal the value **Converter status negated** (negation of the status word) is selected again and the bit "Accel/Decel. F" is set in the parameter **Opt. meas. turns on [160].** This means, that after the optimization output change, the process is waiting for the ramp function to settle and then a new measurement for the next optimization step is performed.

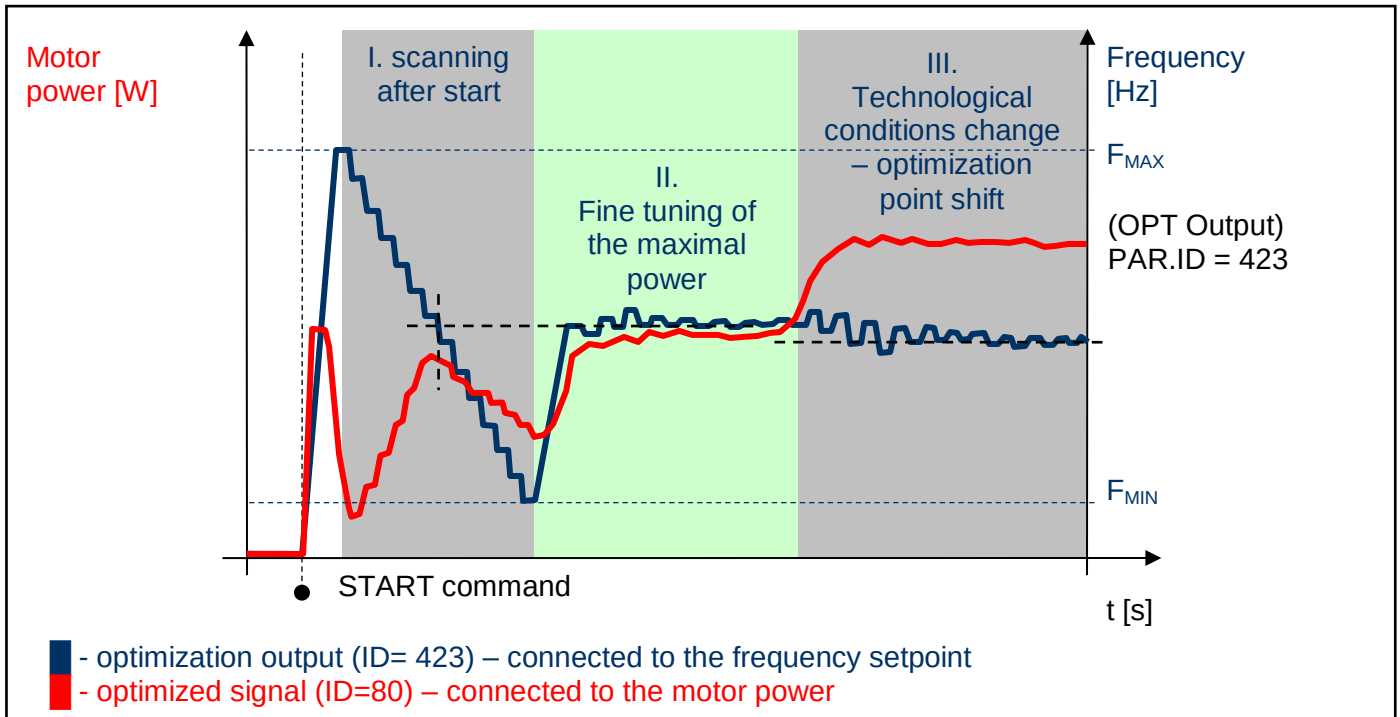

Signal selection
\MENU\DIAGNOSTICS\Converter state
MT operational hours 44.3 h
Converter state
Converter state negated
Warning 0x0
Warning2 0x0


Opt. meas. turns on
MT excited
Accel./Decel. F
Fsp > 0
F = Fsp
Warning

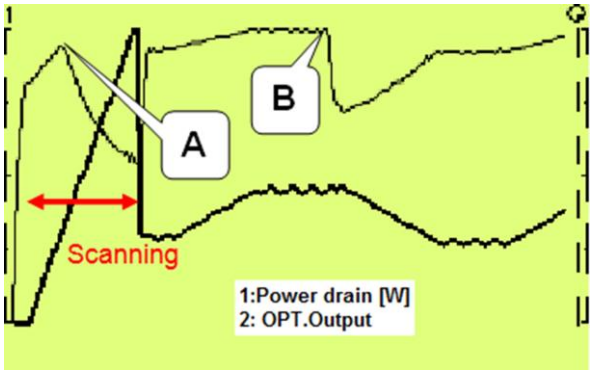
To adjust and configure the optimization process, use folowing parameters:

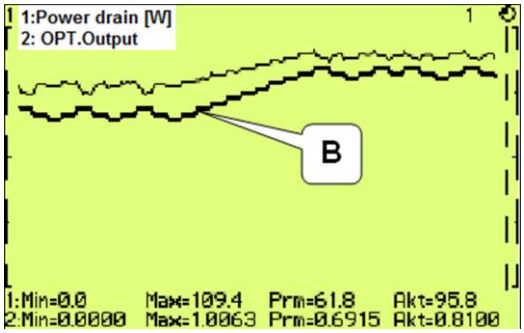
Parameter name	ID	Description
Optimization period	**13**	Measuring period of one step of the optimization algorithm. Time between individual steps can be extended by the measurement condition (see "Opt. Measurement signal [279]").
Scan	**420**	Activate/Deactivate the scan mode of the optimization output when starting the optimization. It is used to find the starting value of the optimization output. It searches for the global extremum from multiple possible extrems by searching the whole range by a maximal step of 0.05.
delta Sign.	**255**	Defines the value of the maximal allowed variance of the actual value "Optim. Signal [80]“ from the global extreme. Global extremum is getting closer to the actual output value from the optimization (scan) start, which follows the slow changes of the global extremes. After deflecting the output from the global extremum by the defined value of "delta Sign.“ a new scan is performed, if it is activated.
Step mode	**425**	Defines, if the change size of the optimization between two steps should be solid or variable. Variable step means, that the step size is based on the adaptivity from the "Optim. Signal [80]“ derivation.
Minim. step	**427**	Minimal or solid optimization output change between two steps.
Adapt. step gain	**743**	Defines the intensity of the "Optim. Signal [80]" derivation effect on the optimization step increase, if the "Step mode" is activated and “variable” is set.
First direction	**426**	Sets the starting direction of the optimization from start, if it should search for output changes up from 0.00 ("from minimum") or down from 1.00 ("from maximum").

Picture: Optimization – principle of the operation by maximizing the power using frequency:



Example: Optimization operation on the drive
(thick line - OPT. Output, thin line - Power drain). In this case, the Start Direction (ID = 426) is set to "From maximum".





A – Optimization starting point found by scanning. It will be configured accurately later during fine tuning.

B – Technological conditions change – optimization output settling and finding the new optimum point.

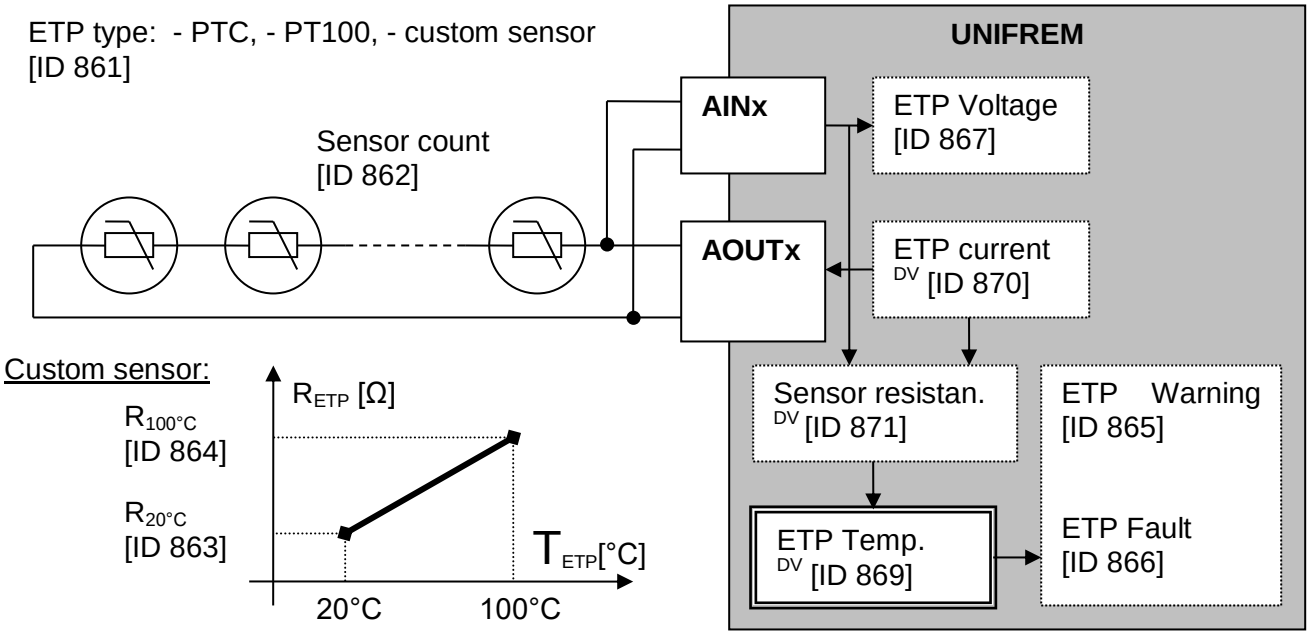
8.11 External thermal protection (ETP)

If there is a temperature sensor or system of multiple sensors of the same type on the device, of which the frequency converter is a part, it is possible to connect these sensors into the converter and evaluate the device temperature and if needed, generate warning or fault. ETP block parameters can be found in:

Parameter ID: 860
SETTINGS –> FUNCTIONS -> EXTERNAL THERMAL PROTECTION (ETP)

One free analog input and output are used to connect the temperature sensors. Mathematical model calculates the optimal *"ETP Current"*, which will be selected as a signal of the corresponding AOUTx. Voltage drop occurs on AINx, AINx writes it into the parameter *"ETP Voltage"*. Sensor resistance and then temperature are evaluated from this data. After exceeding the warning or fault limit, ETP temperature warning or fault is generated.

Meaning of the parameters and their logical connection is explained in the following picture.



One analog input (free) and one analog output (free) of the X1 terminal of UNIFREM processor board can used to connect the sensor.

ETP setting example – 3 x PTC sensor types connected in series:
PART SETTINGS:

PTC sensor setting:

[ID]	Path	Parameter	Setting
861	MENU \ SETTINGS \ FUNCTIONS \ EXTERNAL THERMAL PROTECTION (ETP) \	**ETP Type**	**PTC thermistor**
906	MENU \ SETTINGS \ FUNCTIONS \ EXTERNAL THERMAL PROTECTION (ETP) \	**Voltage source ETP**	**AIN2**
862	MENU \ SETTINGS \ FUNCTIONS \ EXTERNAL THERMAL PROTECTION (ETP) \	**Sensor count**	**3**

Example of setting – ETP warning and fault lines derived from the parameters:

865	MENU \ SETTINGS \ FUNCTIONS \ EXTERNAL THERMAL PROTECTION (ETP) \	**ETP Warning**	**90°C**
866	MENU \ SETTINGS \ FUNCTIONS \ EXTERNAL THERMAL PROTECTION (ETP) \	**ETP Fault**	**160.0 °C**

ETP maximal current restriction:
Parameter **ETP maximal current (ID 1087)** restricts the current to the EHP sensors to prevent undesired overheating of the sensor. If a special sensor is used, it is necessary to set the maximal current according to its specification. In the EHP = PTC type, the measuring current is limited to the 1mA value and in the PT100 type to 3mA and then this parameter is inactive.

1087	MENU \ SETTINGS \ FUNCTIONS \ EXTERNAL THERMAL PROTECTION (ETP) \	**ETP maximal current**	**10.00 mA**

Analog input AIN2 setting:

[ID]	Cesta	Parameter	Setting
154	MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN2 \	**AIN2 Type**	**0-10V**

The option of noise filtering on the analog input:

262	MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG INPUTS \ AIN2 \	AIN2 Filter	1s

Analog output AOUT2 setting:

[ID]	Path	Parameter	Setting
362	MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG OUTPUTS \ AO2 \	AO2 Type	0-20mA
1077	MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG OUTPUTS \ AO2 \	AO2 Source	ETP Current
366	MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG OUTPUTS \ AO2 \	Sig. (AO2_A)	0 mA
368	MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG OUTPUTS \ AO2 \	Sig. (AO2_B)	20 mA
945	MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG OUTPUTS \ AO2 \	AO2_A	0 mA
946	MENU \ SETTINGS \ INPUTS AND OUTPUTS \ ANALOG OUTPUTS \ AO2 \	AO2_B	20 mA

ETP DIAGNOSTICS:

The possibility of checking the measured data:

[ID]	Path	Parameter	Description
869	MENU \ DIAGNOSTICS \ Functions \ Ext. thermal protection \	ETP Temperature [°C]	Temperature of the ETP sensor.
870	MENU \ DIAGNOSTICS \ Functions \ Ext. thermal protection \	ETP Current [mA]	Measuring current of the external thermal protection.
867	MENU \ DIAGNOSTICS \ Functions \ Ext. thermal protection \	ETP Voltage [V]	Value of measured voltage drop on the ETP sensor.
871	MENU \ DIAGNOSTICS \ Functions \ Ext. thermal protection \	Sensor rezistance [Ω]	Resistance value of the ETP sensor.

8.12 Overload switch „OPS“

For the evaluation of the maximum load of the construction or technological line, various devices are used especially in lift drives of cranes, but also in other areas of frequency converters deployment. Frequency converters UNIFREM can evaluate the load of the drive by measuring the electrical parameters (Displayed value - Load) and carry out the necessary changes in the behavior of the drive, so that the operation of the drive will be safe. „OPS“ can be used for example for stroke drives of cranes, shifts at cutting, drilling and supports of machine tools. A new conception of overload switch in UNIFREM frequency converters includes several improvements and innovations.

Terms:
Load – It is an optional quantity, which represents a measure of the drive load. Motor torque, motor current, Power or even AINx can be generally chosen, if load evaluation is external.

Overload – It is the drive status when the conditions of the drive overload are fulfilled. STOP can be generated automatically, speed can be limited, or it can be signalized on the converter outputs.

Dynamic operation – It is the working status of the drive when accelerating in the positive direction, when the drive overcomes the resistance of inertia mass and Coulomb friction except static load.

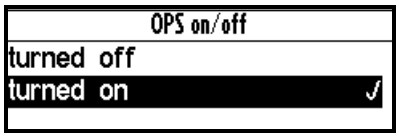
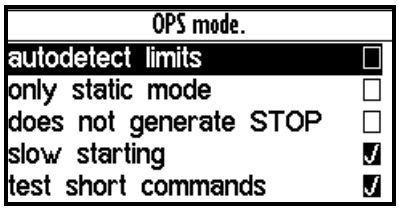
Static operation – It is the working status of the drive during steady-state speed in the positive direction.

Short commands count – It is a sequence of control commands, which bypasses the conditions of formation of overload. For example, short commands START or intermittent acceleration.

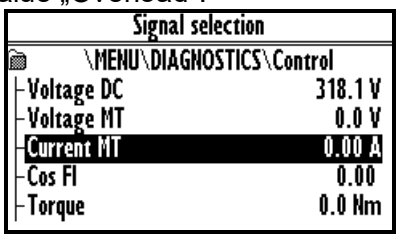
The following parameters are used to configure the overload switch:

Parameter ID: 840
SETTINGS –> FUNCTIONS -> LIFTING FUNCTIONS -> OPS

Configuration and mode of operation:

Parameter name	ID	Description
OPS on/off	**841**	Activation or deactivation of the electronic OPS switch function. 
OPS mode	**842**	Activating the overload switch modes. 

The method of calculating the value „Load“: Lifting functions

Load. signal	**843**	Selection of the parameter, that will be used as calculation source for the displayed value „Overload“.  *Example of variable selection, which is a measure of the drive load.*
100% Load	**844**	It is used to conversion to relative units. Value of the selected load signal (ID 843) that equals 100% of the load.
Load filter	**851**	First row filter, that is used for noise or short peaks of the selected load signal (ID 843) reduction.

Conditions of "Overload" appearance and disappearance**:**

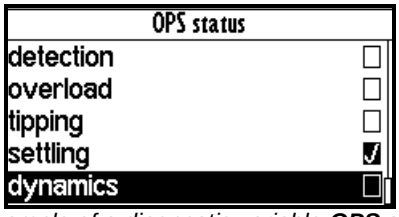
Time after the start	**852**	Insensitivity period of the OPS after the drive start.
Dynamic overload	**845**	Drive overload limit in dynamic states (when accelerating in positive direction).
Dynamic overload period	**848**	Period during which the load value has to be higher than the dynamic overload limit, so the overload switch will switch on.
Static overload	**846**	Drive overload limit in static states (at a constant speed in a positive direction).
Static overload period	**849**	Period during which the load value has to be higher than the static overload limit, so the overload switch will switch on.
Overload turn off	**847**	Load limit to end the Overload in the backward movement at constant speed.
Overload period turn on	**850**	Period during which the load value has to be lower than the overload stop limit, so the overload switch will switch off.

Blocking signal of „Overload“:

OPS reset source	**572**	This command blocks or switches off the OPS switch. Numeric or bit signal can be selected.
OPS reset	**858**	The OPS reset command will be active if at least one of the selected binary inputs or logical blocks will be active.

These displayed quantities serve for OPS diagnosis and evaluation: lifting functions

Load	**854**	Drive load rate evaluated from the signal **Load. signal** (ID 843) and related to 100**% Load** (ID 844). [%]
Short commands count	**855**	Number of forbidden short command sequences. After exceeding the short commands count, the overload switch will switch on regardless of the drive load. Short commands evaluation can be turned off by the parameter (ID 842).
OPS status	**856**	Indicates the status of the Overload switch block.



*An example of a diagnostic variable **OPS status***

Overload of the drive will appear:

- If terms of formation of overload are met during operation. If the mode (ID 842) ***„only static mode“*** is inactive during dynamic operation, when the „Load“ exceeds the value of parameter „Dynamic overload“ (ID 845) for the time longer as „Dynamic overload period“ (ID 848). Similarly, if the "Load" exceeds the static limit for the corresponding time in the static mode.
- Or if is mode (ID 842) ***„test short commands“*** turned on and number of short commands in counter of short commands exceeds 5 short commands within 5 min.

Converter signalises status of overload also with functional message ***F36-OPS switched on***. on the display of control panel.

Overload of the drive will disappear:

- If the "load" falls below the value of the parameter „Overload turn off“ (ID 847) in the reverse operation mode for the period longer as „Overload period turn off“ (ID 850).

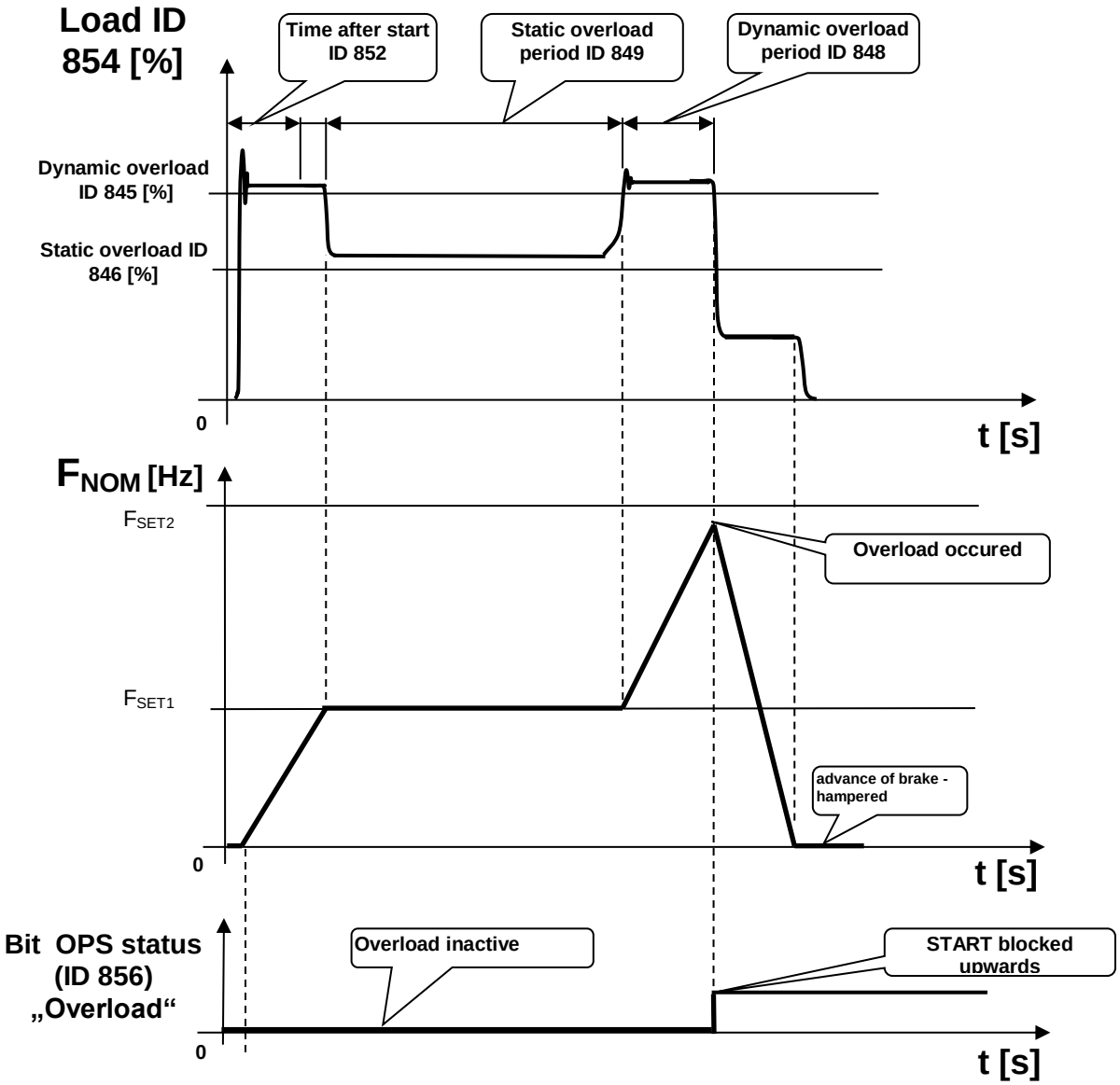
In OPS mode (ID 842), it is possible to choose the function ***„slow abseil“***. This function limits the speed to 20% in the reverse operation at overload to increase safety when handling excessive loads.

Then in the modes it is also possible to disable the internal blocking of drive start in the positive direction with the choice ***„does not generate STOP“***, in cases, when only signalisation or the other action should be executed at overload (for example, the speed or torque restriction). The other actions are adjusted by using universal control blocks of converter.

Limits autodetection:

One of the new OPS modes (ID 842) is ***„autodetect limits“***. Limits of overload conditions are reset after turning on this mode (ID 845, ID 846, ID 847) and during the following working cycles of the device, the limit values of parameter "Overload" are automatically detected.
The drive should be loaded with maximum safe load at this detection. (maximum permissible weight, etc). The values of limits will probably settled after 5 to 10 cycles and will stabilize at the levels that are little above the maximum working load. After turning off this mode, detected limits will remain at the new values and OPS is working within them.
Converter generates function message F37-Overload detection during „autodetect limits“.

Image below: Example of overload formation in dynamic mode of operation during lifting the weight.



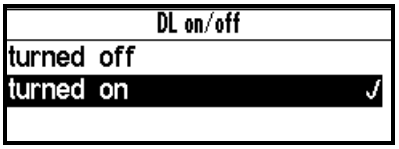
8.13 Dynamic lift (DL) function

Crane function - **DYNAM. LIFT (DL)** (ID 1068) is used to adjust the maximum lift speed according to the actual weight. Maximum speed is reduced for higher weight.

For correct operation of the dynamic lift is necessary to set the parameters, which determine the calculation of the quantity "Load" (ID 854) as set by "Overload switch".

Parameter name	ID	Description
Load. signal	**843**	Selection of the parameter, which will be used as calculation source for the displayed value „Overload“.
100% Load	**844**	It is used to conversion to relative units. Value of the selected load signal (ID 843) that equals 100% of the load.
Load filter	**851**	First order filter, which is used for noise or short peaks of the selected load signal (ID 843) reduction.

Following parameters can be used to configure dynamic lift function:

DL on/off	**1069**	Activation of deactivation of the dynamic lift (DL) function. 
DL measurement period	**1070**	Period of measurement of the static load (ID 854) on the frequency - parameter „DL frequency“ (ID 1073).
DL maximal load	**1071**	The upper range of the load, over which the maximum frequency is not reduced further.
DL minimal load	**1072**	Lower range of the load, under which dynamic lift works with the maximum allowed frequency.
DL frequency	**1073**	Frequency, at which the load measurement runs and frequency which represents the minimal speed that corresponds with the maximal load.

These display units serve for diagnosis and evaluation of overload switch.

Load	**854**	Drive load rate evaluated from the signal **Load. signal** (ID 843) and related to 100**% Load** (ID 844). [%]
OPS status	**856**	Static or dynamic mode detection.

Principle of operation:

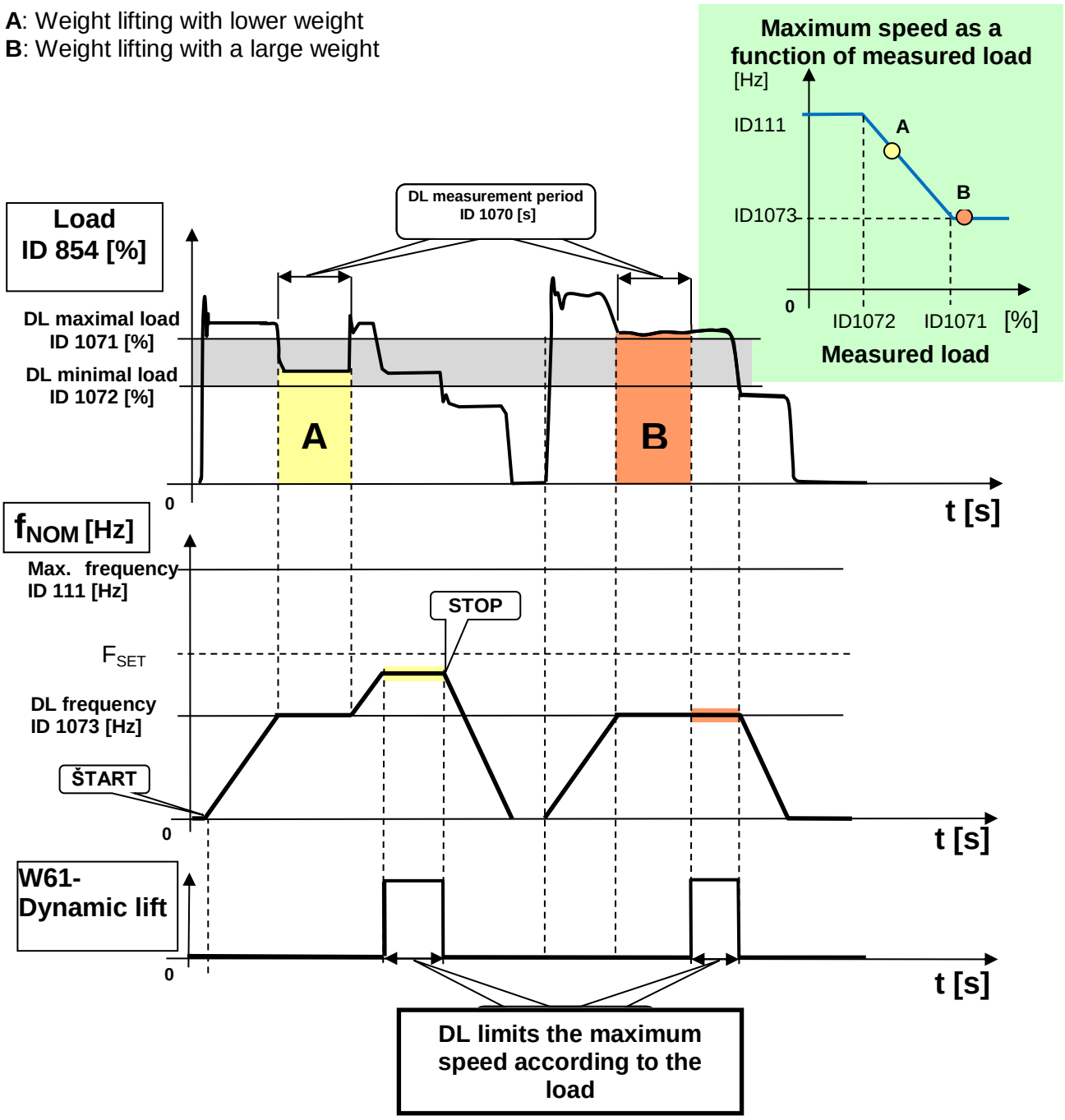
When starting upwards, the frequency stops on the "DL frequency" (ID 1073) for a time "DL measurement period" (ID 1070), in order to have stabilized value of "Load" (ID 854) and then calculate new speed limit. If the load stabilizes in the interval between the "DL minimal load" (ID 1072) and "DL maximal load" (ID 1071), then the lift speed limit is calculated linearly between the "DL frequency" (ID 1073) and "Max. frequency "(ID 111).

If the lift is loaded to "DL maximal load" (ID 1071) or higher, its maximum speed will be limited to "DL frequency" (ID 1073). If the lift is loaded to „DL minimal load“ (ID 1072) or lower, its maximum speed will be limited to value of „Max. frequency“ (ID 111).

If the calculated speed limit is less than the "Max. frequency" (ID 111), converter displays a warning message "**W61-Dynamic lift**".

Image below: The principle of the "Dynamic lift" function.

A: Weight lifting with lower weight
B: Weight lifting with a large weight



8.14 IRC detuning function

Frequency converters UNIFREM can simultaneously evaluate the real-time signals from two incremental encoders in case of use the extension module RM_IRC_DUAL. Converter calculates the speed difference of these sensors and this difference is displayed in the parameter „Freq. IRC1-IRC2“ (ID 1086) according the formula:

$$F_{IRC1-IRC2} = | |F_{IRC1}| - |F_{IRC2}| |$$

$|F_{IRC1(2)}|$ means absolute value of the speed calculation from the values „Frequency IRC1” (ID 434) and „Frequency IRC2” (ID 803).

The need to derive some control actions as torque restriction, block or immediate shutdown from the detuning can occur in the multi-motor drives in practice.

For example:

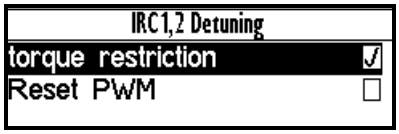
- When one traction vehicle axle or bridge travers is slipping against the other
- Torque limit reduction, so the vehicle axle with less adhesion does not outrun the other

- RESET can be generated at material supply interruption and drives detuning on the rolling line (one part of the line is under load and the other no-load)
- etc.

Parameters in parameters group are used to configure „IRC detuning“ function.

Parameter ID: 1081
SETTINGS –> FUNCTIONS -> IRC1,2 DETUNING

Configuration and mode of operation:

Parameter name	ID	Description
IRC1,2 Detuning	**1082**	Setting the operation method and the converter operation when detuning the IRC1 and IRC2 speed. 
torque restriction	IRC1, 2 detuning will cause torque restriction of motors.	
reset PWM	IRC1, 2 detuning will cause immediate shutdown of motors (RESET).	
Filter dIRC1,2	**1083**	Time constant of the IRC1 and IRC2 frequency difference filter.
Minimal IRC1,2 difference	**1084**	Minimal limit of the absolute value for the IRC1 and IRC2 frequency difference.
Maximal IRC1,2 difference	**1085**	Maximal limit of the absolute value for the IRC1 and IRC2 frequency difference.

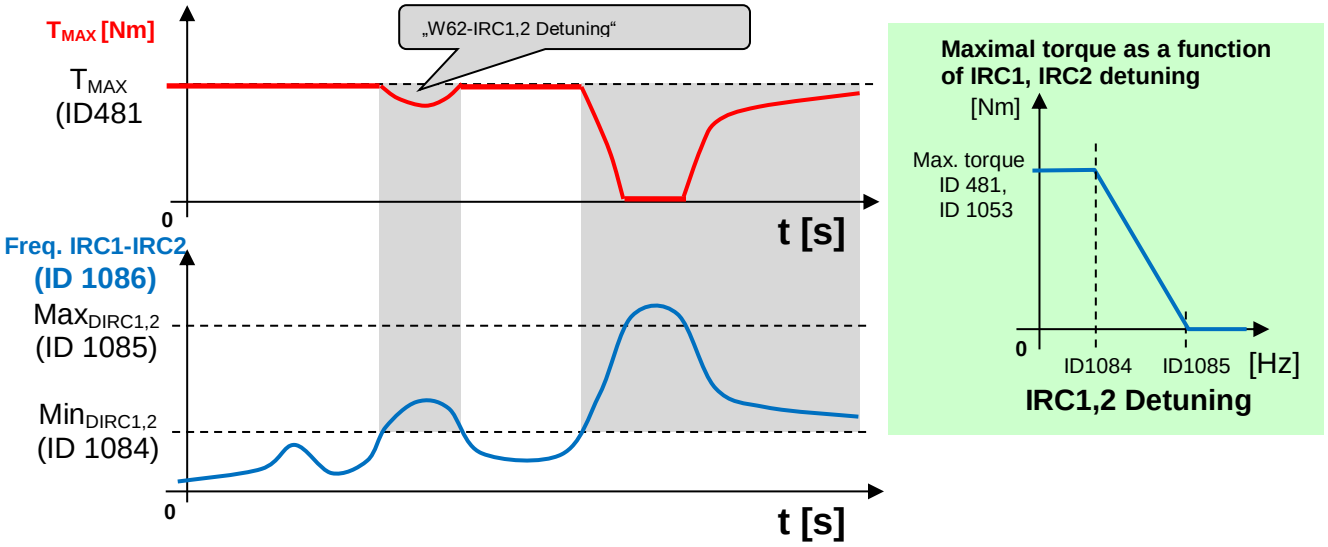
These displayed values are used for diagnosis and evaluation:

Frequency IRC1	**434**	Rotor frequency defined by the rotation speed sensor from the IRC1 motor.
Frequency IRC2	**803**	Rotor frequency defined by the rotation speed sensor from the IRC2 motor.
Frequency IRC1-IRC2	**1086**	This value is filtered by the first row filter from the parameter „Filter dIRC1,2“ (ID1083).

Principle of operation:

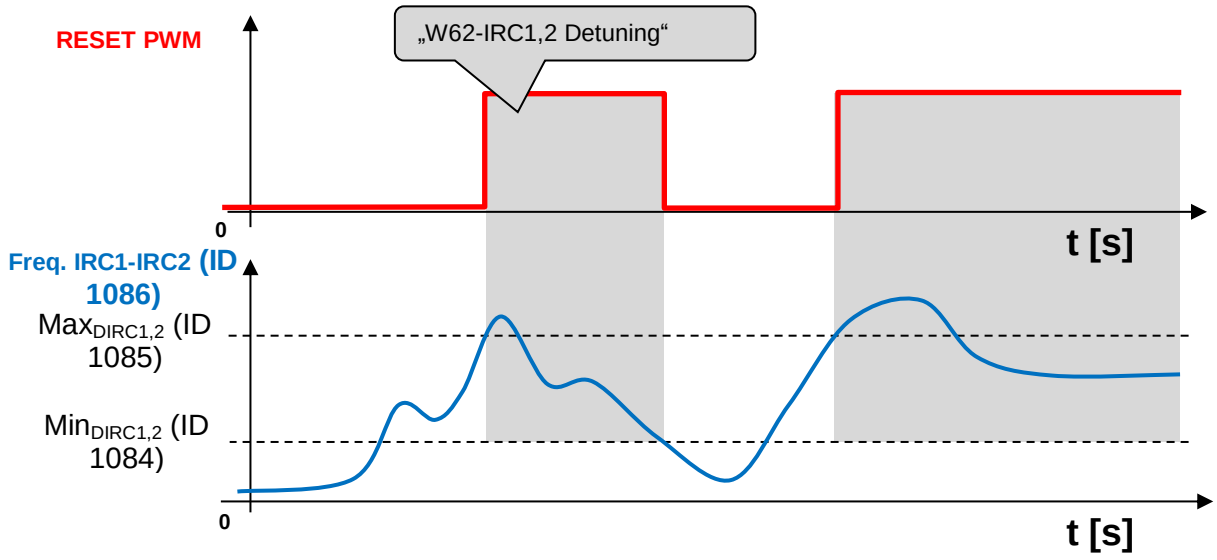
Motor torque restriction starts to decrease when the minimal value of frequency difference "Minimal IRC1, 2 difference" (ID 1084) is exceeded, if the choice „torque restriction“ is active in the parameter „IRC1,2 Detuning“ (ID 1082). Torque is **zero** at the maximal difference "Maximal IRC1, 2 difference" (ID 1085). Shutting down the drive is smoothly proportional to detuning value. Warning „**W62 - IRC1,2 Detuning**“ is displayed during torque reduction.

Image below: Principle of the „IRC Detuning“ function at active choice „torque restriction“.



REST PWM is generated when the maximal limit of frequency difference „Maximal IRC1,2 difference“ (ID 1085) is exceeded, if the choice „reset PWM“ is active in the parameter„IRC1,2 Detuning“ (ID 1082). “RESET PWM” expires after decrease under „Minimal IRC1,2 difference“ (ID 1084).

Image below: Principle of the „IRC Detuning“ function at active choice „reset PWM“.



By adjustable filter „Filter dIRC1,2“ (ID 1083), short pulses of IRC can be filtered, quantization noise is damped and dynamics od torque change can be adjusted.
The impact of IRC detuning to the maximal torque and to the RESET PWM too can be combined with simultaneous activation of the both options.

8.15 Using the parameter set switching for a special behavior of converter functions

UNIFREM frequency converters contain 4 user parameter sets, which can be switched and edited independently in the converter. Set switch period is currently less than 50ms. If the parameter settings are not different for parameters which block the change on-the-run (like Output phase sequence), it is possible to switch the sets during operation. The source of the set switch can be configured to any converter signal. This allows to solve special functions conditioned by changing the parameters, which individual functional blocks of the converter when using single set do not allow.

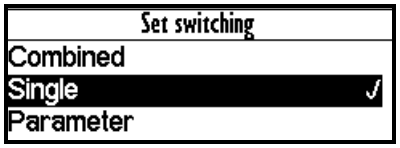
For example:

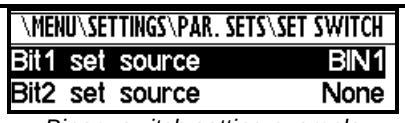
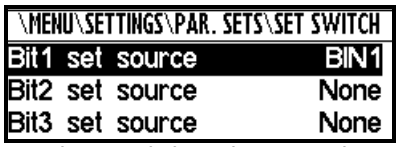
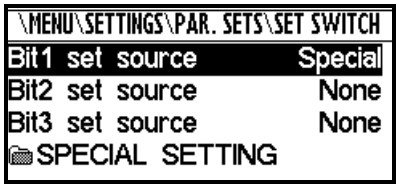
- V/f curve parameter change when changing the motor rotation direction.
- converter control sources change from the binary input (switching locally/remotely).
- controller parameter adaptivity according to the regulated frequency range.
- and many more.

Parameter set switch conditions are configured in these converter parameters:

Parameter ID: **206**
SETTINGS –> PAR. SETS

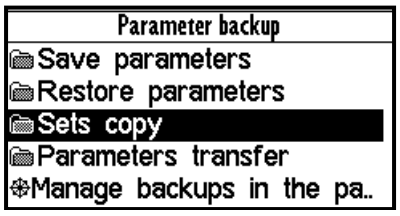
Switch set of parameters example configuration:

Parameter name	ID	Description
Set switching	**657**	Setting the way of switching between the sets. (**Combined, Single, Parameter**)  *Active set switching setting example*
Possibility to switch the active set:		SETTINGS –> PAR. SETS –> Set switching [657] –> **Parameter** Option of the active set setting: **Active set [205]** –> option choice **Set 1, Set 2, Set 3, Set 4**
Bit1 set source **Bit2 set source** **Bit3 set source**	**641** **642** **643**	**Setting the bits of set switch.** Its function depends on the parameter **Set switching [657]** setting. **<u>1.way</u>** **Set switching [657] - Combined -** Only the first 2 bits of the binary switch are used. Output set corresponds to the binary combination of these bits. If no bits are active, the 1st set is active. If only 1 bit is active, the 2nd set is active, and so on. SETTINGS –> PAR. SETS –> SET SWITCH **Setting possibility: Bit1 set source and Bit2 set source**

		 *Binary switch setting example* **2.way** **Set switching [657] – Single -** Every single bit of the binary switch represents one set (bit 1 represents set 2). If more switches are active, the set with the higher sequence number is active. If no binary switch is active, the 1st set is active. SETTINGS –> PAR. SETS –> SET SWITCH **Setting possibility: Bit1 set source, Bit2 set source, Bit3 set source**  *Binary switch setting example*
SPECIAL SETTING [224] Special functions setting for the set switches.		Special source of set switch setting example: SETTINGS –> PAR. SETS –> SET SWITCH –> Bit1 set source [641]–> **special**  Then there is the possibility of setting SETTINGS –> PAR. SETS –> SET SWITCH –> SPECIAL SETTING –> Bit1 set signal [645] –> Signal that is evaluated if the 1st bit of the binary switch is active. Either a numeric or a bit signal can be chosen.

Before switch source setting of the active parameters set, it is necessary to configure the drive in the SET1 completely, it means that at deactivated set switch conditions. Then copy this setting to other sets by using commands:

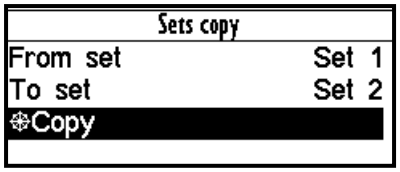
MENU -> SAVE / RESTORE -> Sets copy



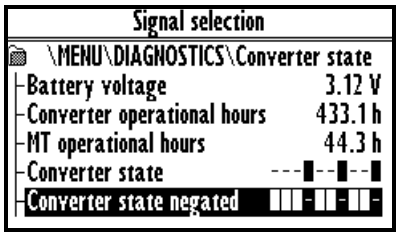
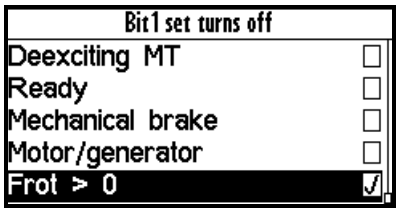
Commands to copy parameter sets:

Function	Choice	Description

From set **To set**	**Set1..Set4** **Set1..Set4**	Copy of the parameters from set 1..4 to the selected set 1..4. Confirm by pressing the "Copy"



At the end, it is necessary to configure the active set switch condition. If we want to use for example only two parameter sets and SET2 should be active on negative speed on the converter output (weight lowering with a different V/f curve starting voltage) Then the following parameter values are selected:

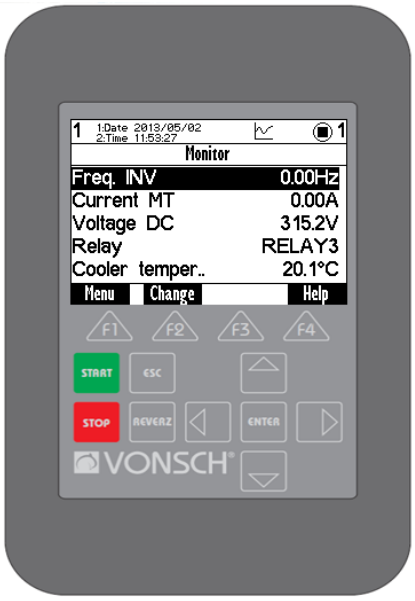
Parameter name	ID	Description
Set switching	**657**	**Single**
Bit1 set signal	**645**	SETTINGS –> PAR. SETS –> SET SWITCH –> Bit1 set source [641] –> **special** Source of set switch choice: Status word negated [547]: SETTINGS –> PAR. SETS –> SET SWITCH –> SPECIAL SETTING –> Bit1 set signal [645] –> **"**MENU\ DIAGNOSTICS\ Converter state –> Status word negated [547]**"** 
Bit1 set switch on	**646**	SETTINGS –> PAR. SETS –> SET SWITCH –> SPECIAL SETTING Bit1 set switch on [649] 14th bit of status word is chosen **„Frot > 0".**  (As it is the negated value of the status word, this bit has the opposite meaning **Frot ≤ 0.**) **Frot** – polarity of the rotor frequency. The sign of the frequency is evaluated by mathematical model if IRC is not available.

We can configure the parameters in individual sets after selecting the edited. Information about which set is active is in the upper right corner of the display, written in a small font.

Using parameter sets thus contributes to increase variability of drive setting. With them, it is possible to solve:

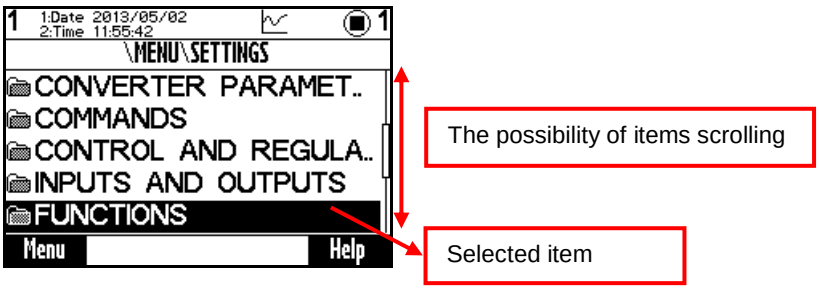
- Asymmetry of ramp frequency
- Control mode switch
- Signals switching at the analog outputs
- Multiple motor control with the one converter
- Corrections or the other converter functions switch on or switch off
- … etc.

9 CONTROL PANEL – UNIPANEL USER MANUAL



CONTROL PANEL

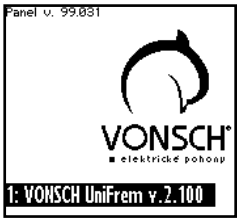
9.1 Buttons

START STOP REVERZ	**Converter control**, if control panel is selected as the control source.
ESC	Change canceling, window closing, return (move up)
ENTER	Item selection, change confirmation
	Moving in the menu, value changing. In the case the folder in the MENU contains more than five items, pressing one of these keys can scroll the screen. Selected row is marked dark. 
	Shift in menu, change of the order **Setpoint value setting** (Monitor window only; if control panel is selected as the setpoint source).

F1	**MENU** view – panel functions selection
F2 F3	Softkeys buttons
F4	Help view

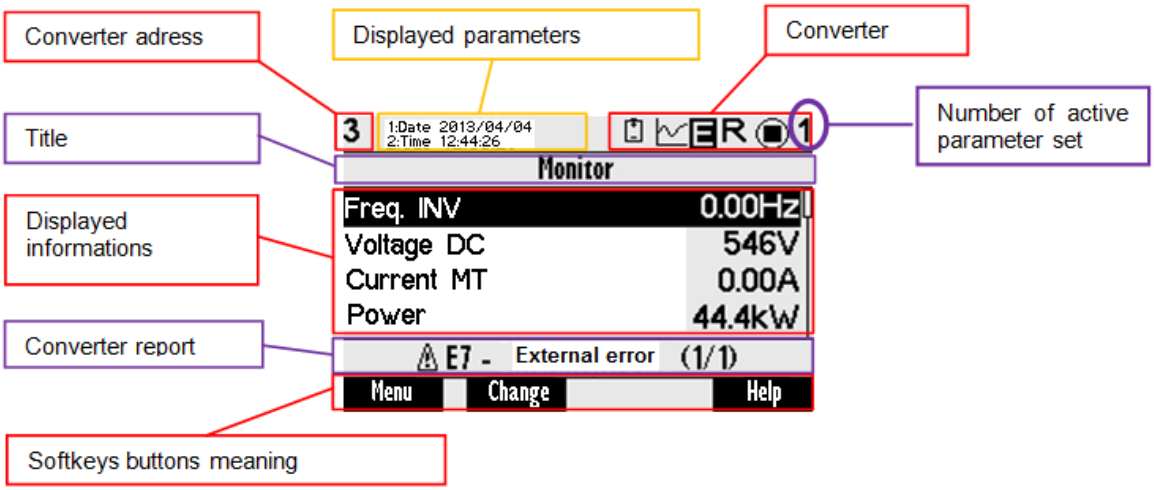
9.2 Panel start

Control panel can be connected to the device that is on or off. Panel automatically turns on and connects to the device after the device is turned on. The panel will try to reconnect to the last connected device if the panel is connected to the multiple devices. Panel will show the list of available devices, if such device does not exist.



INITIALIZATION

9.3 Display

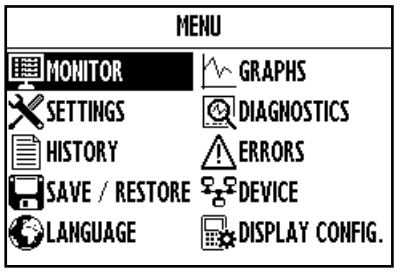


9.4 Converter status

	Weak battery in control panel (should be replaced).
	Graph record is running in panel.
E W	Converter is in fault – E, warnings or functional messages indication – W.
R	Converter reverse is active (negative frequency).
	Converter is stopped (square), in operation (spinning target).
1, 2, 3, 4	Number of active set in converter.

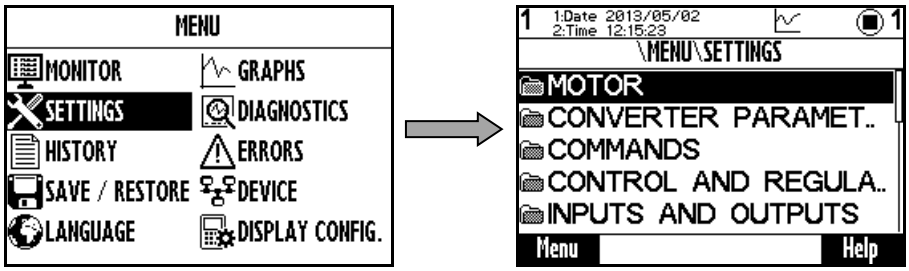
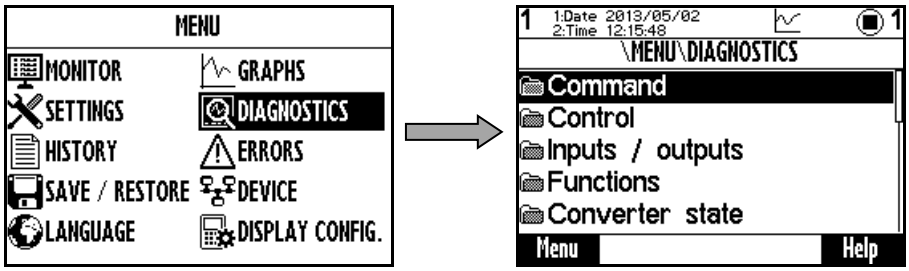
9.5 Main Menu

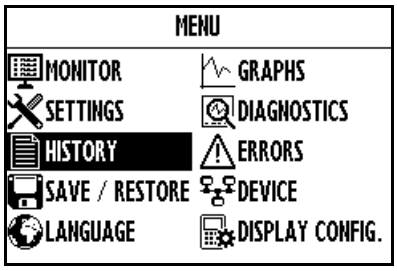
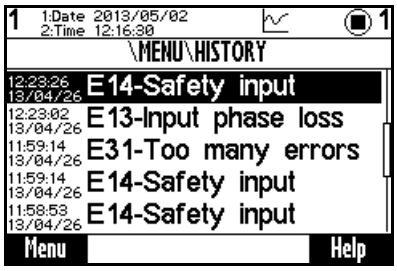
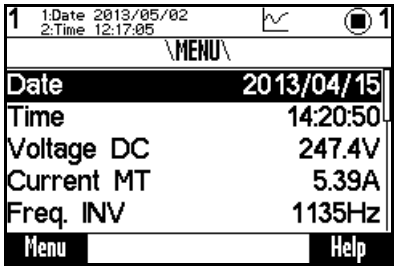
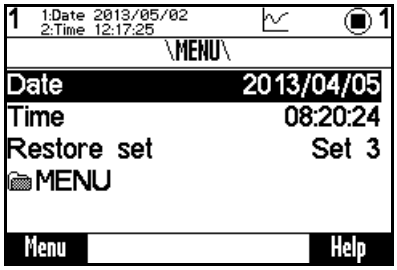
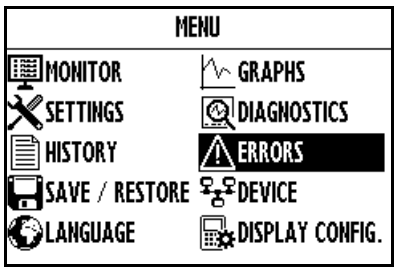
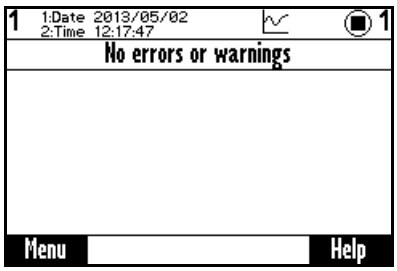
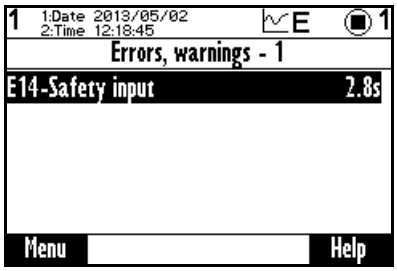
INITIAL MENU SCREN

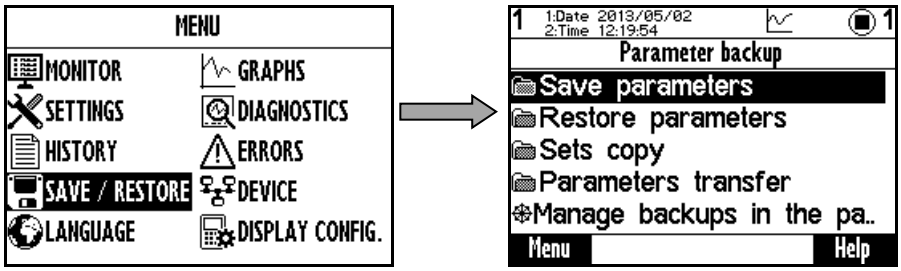
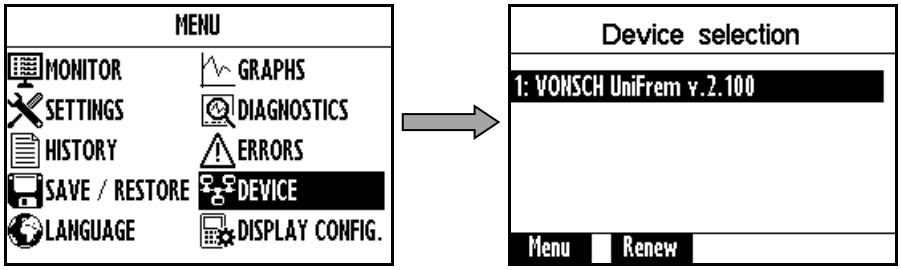
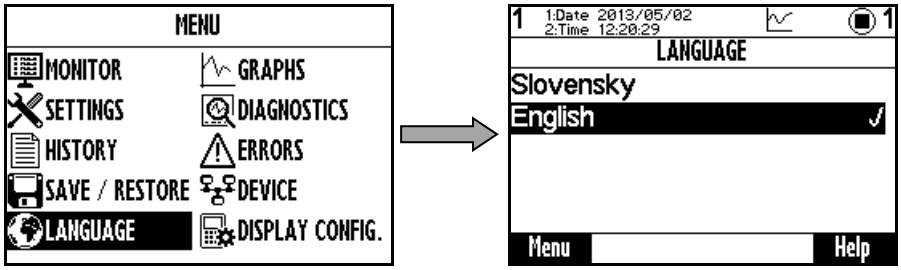
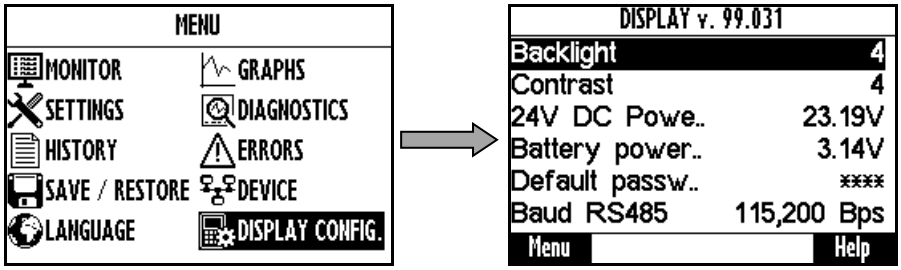


Press F1, or by using the selection arrows to toggle between MENU items.
Selecting the panel function (by pressing „**ENTER**")

Panel function selection

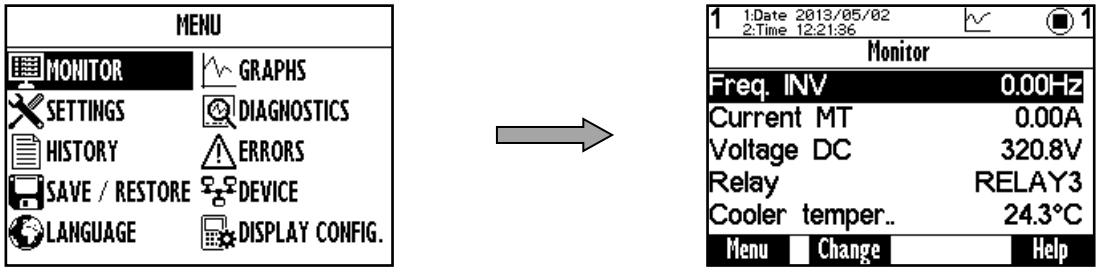
	MONITOR	Monitor view (Monitor detail) Setpoint frequency setting, if control panel is selected as the setting source
	GRAPH	Signal record displaying.
	SETTING	Converter parameter setting in the tree structure. Move by using selection arrows or by using the F1 button to the SETTINGS item and confirm by pressing ENTER. 
	DIAGNOSTICS	All converter status informations displaying in the tree structure.Move by using selection arrows or by using the F1 button to the item DIAGNOSTICS and confirm by pressing ENTER. 
	HISTORY	Move by using selection arrows or by using the F1 button to the item HISTORY and confirm by pressing ENTER. Converter events (Parameters restore, parameter change..) and event history displaying (date and time of event emergence, description). After fault

		or event selection, recorded data at emergence will be displayed.   **EXAMPLE:** **RECORDED DATA AT FAULT - OVERCURRENT**  **RECORDED DATA OF CONVERTER EVENT – PARAMETER RESTORE** 
	ERRORS	Current fault and fault status view (persists, subtracting time after error, waiting to confirmation), converter warnings or functional messages. In the main MENU to confirm the selection with ENTER.   **EXAMPLE:** **TIME IS SUBTRACTING AFTER ERROR END** 
	SAVE / RESTORE	Creating and restoring backups of parameters sets. Backup management, sets copy, special partial copy.

		
	DEVICES	The device selection. Panel scans the bus looking for all the devices on the network. After the restart, the panel tries to connect with the last communicated coverter. 
	LANGUAGE	Panel communication language change. (Slovak, English). 
	DISPLAY CONFIG.	Control panel (brightness, contrast, ...) and diagnostics (supply voltage, battery voltage, ...) setting. 

9.6 Monitor

MENU window switches to the MONITOR window after 20 seconds of inactivity, or confirm the selection MONITOR by pressing ENTER.

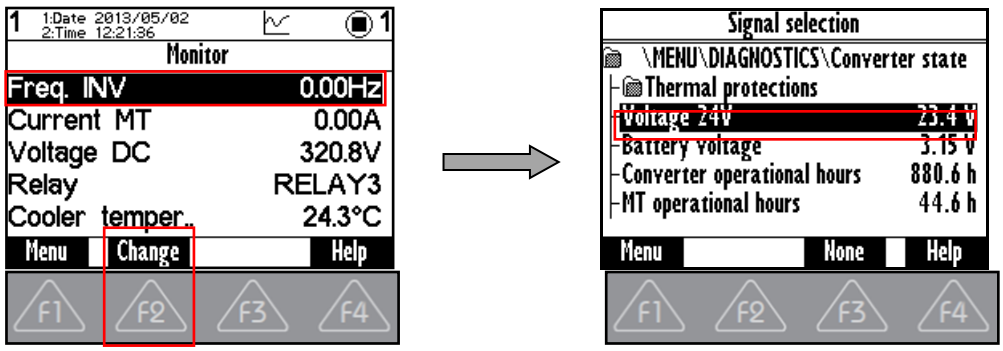


The basic window displays the selected monitored values after panel start.

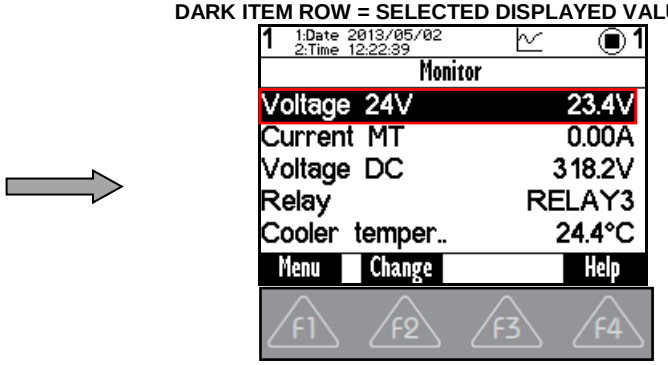
	Monitor	**Monitor detail**
ENTER	Monitor detail will be displayed	Monitor will be displayed
ESC	Menu will be displayed	Monitor will be displayed
F2 Change	Change of the selected displayed value **EXAMPLE:**	

SELECTED VALUE CHANGE (SELECTED ITEM) -> PRESS F2 (Change)

SELECTION OF THE REQUIRED DISPLAYED VALUE FROM THE DIAGNOSTICS -> TO CONFIRM – ENTER



Monitor WINDOW DISPLAYING AFTER CONFIRMATION
DARK ITEM ROW = SELECTED DISPLAYED VALUE



9.7 Parameter setting

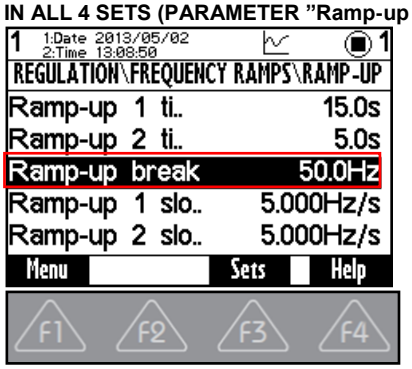
Converter contains 4 sets of parameters.

Control panel offers direct set up of the parameter if the same value is set in all the sets of parameters. After parameter change confirmation, the same value is saved to all sets of parameters.

Panel offers parameter settings for each set if different value is set in sets (if the parameter value is different in at least one set), or if the parameter is marked by pressing F3 - SETS and panel will offer parameter setting for each parameter set independently.

EXAMPLE:

1. POSSIBILITY OF DIRECT SETTING OF THE SELECTED PARAMETER (PRESS - ENTER), BECAUSE THE SAME VALUE IS SET IN ALL 4 SETS (PARAMETER "Ramp-up break (ID 117 = 50Hz IN THIS EXAMPLE)":

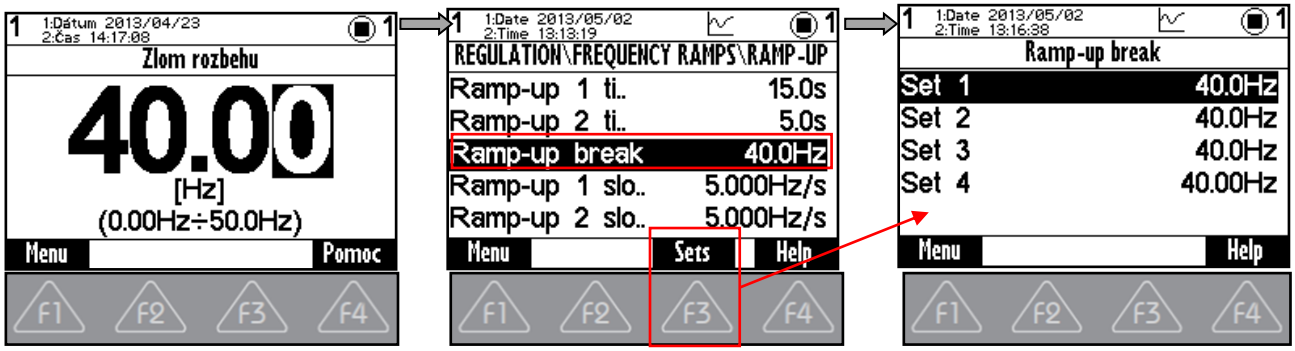


2. PARAMETER VALUE SETTING AND THE SAME VALUE IS SAVED IN ALL 4 SETS AFTER CONFIRMATION:

PARAMETER VALUE SETTING AND CONFIRM – ENTER

PARAMETER SET VALUE IS DISPLAYED AFTER CONFIRMATION

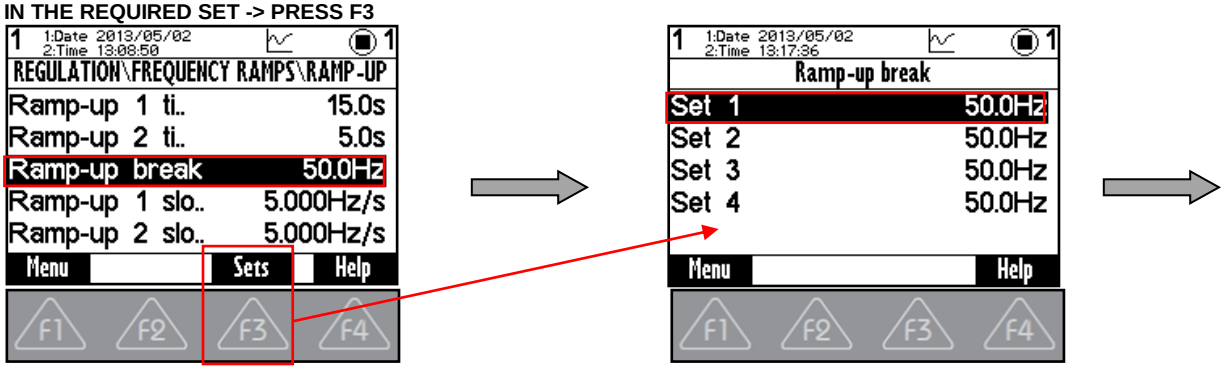
SAME PARAMETER SETTINGS WILL BE SAVED INTO ALL SETS AFTER PRESSING F3



Panel offers parameter setting for each set if different value is set in one of the sets, or if the parameter is "open" by pressing F3 - SETS and panel will offer parameter setting for each parameter set.

SELECTED PARAMETER SETTING IN THE REQUIRED SET -> PRESS F3

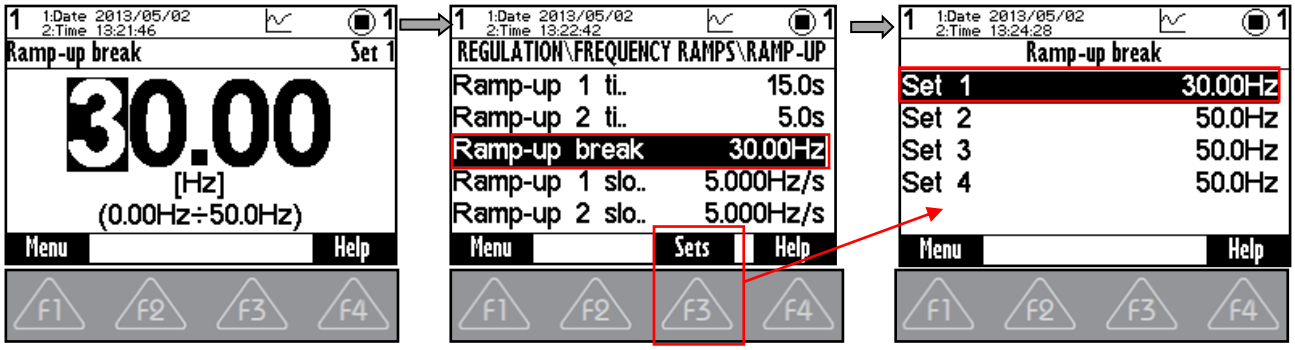
SET SELECTION AND CONFIRM WITH ENTER



PARAMETER VALUE SETTING AND CONFIRM WITH ENTER

PARAMETER SET VALUE WILL BE DISPLAYED AFTER CONFIRMATION

PARAMETER SETTINGS WILL BE DISPLAYED AFTER PRESSING F3 IN THE SELECTED SET



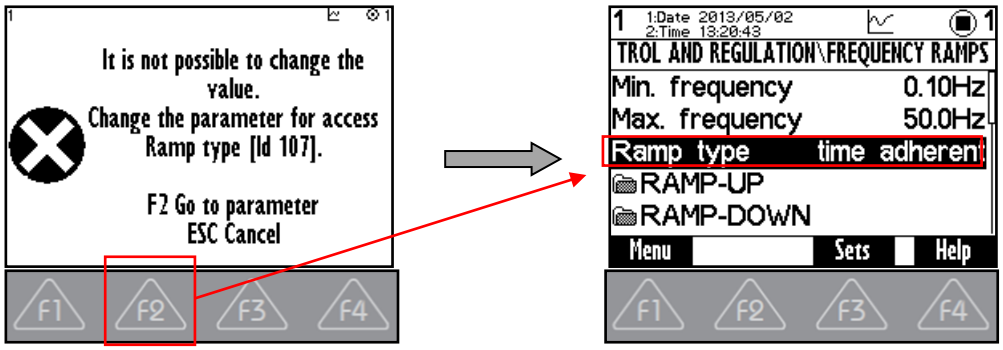
Currently unavailable parameters are displayed grey - disabled. After their selection (confirm by pressing ENTER), panel shows the parent parameter which disabled it. This also helps to make it available.

EXAMPLE:

PARAMETER "Ramp-up 1 slope (ID 124)" – PARAMETER IS DISPLAYED GREY

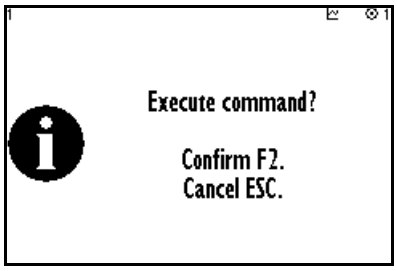
AFTER CONFIRMATION – ENTER, OPTION TO MAKE PARAMETER AVAILABLE IS DISPLAYED

TRANSFER TO THE PARAMETER TO MAKE AVAILABLE IN THE SET AFTER PRESSING F2

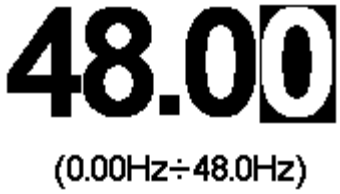


Parameters can be of different types and therefore their setting is different.

Command	**Parameter group** - grouping of parameters having common functionality - creates a tree structure - return to the higher level ESC
Motor 400/0.12	**Command start and execution** PRESS THE BUTTON AT THE SELECTED ITEM WITH THE PARAMETER TYPE OF COMMAND



Execution must be confirmed by F2

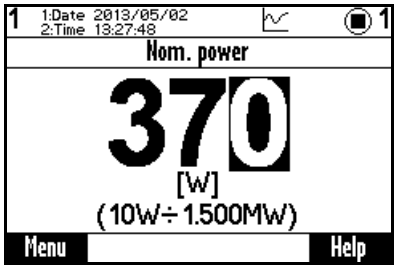


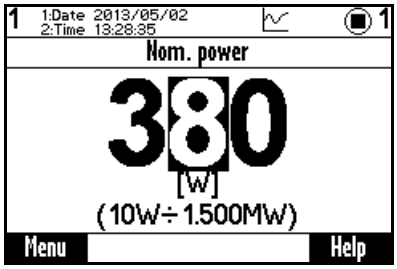
Numeric value setting

-setpoint value setting

-change of adjusted numerical order (cursor position change)

VALUE SETTING AND NUMERICAL ORDER CHANGE





The maximal and minimal possible displayed adjustable value as well as physical units of the parameter are displayed in this window. The change of the displayed engineering units (n, μ, m, k, M, G,...) is done automatically, if it is allowed by these physical units. Cursor is displayed on the the digit, that is currently set, if it is possible to set the parameter. If it is not possible to change the parameter, cursor is not displayed.

- change will be applied immediately after confirmation

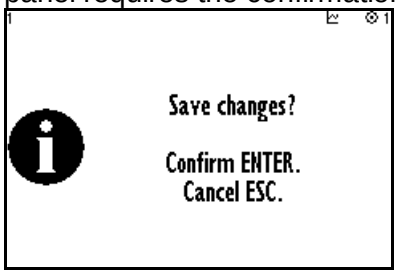
One item selection from the list

- one item has to be always selected
- change will be applied immediately after confirmation

Multiple options selection (MULTIPLE SELECTION)

-no item may be selected
-multiple items can be selected

- selected changes are confirmed with esc, where the panel requires the confirmation



Parameter type of signal

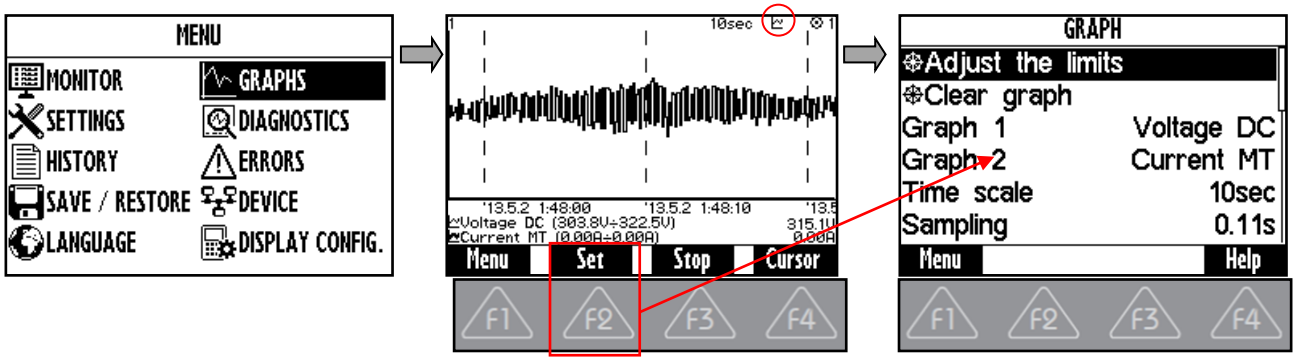
-selection of the parameter that affects the selected action
-parameter selection from the tree structure

-parameter transition in the same level

-transition to the another level in the tree

9.8 Graph

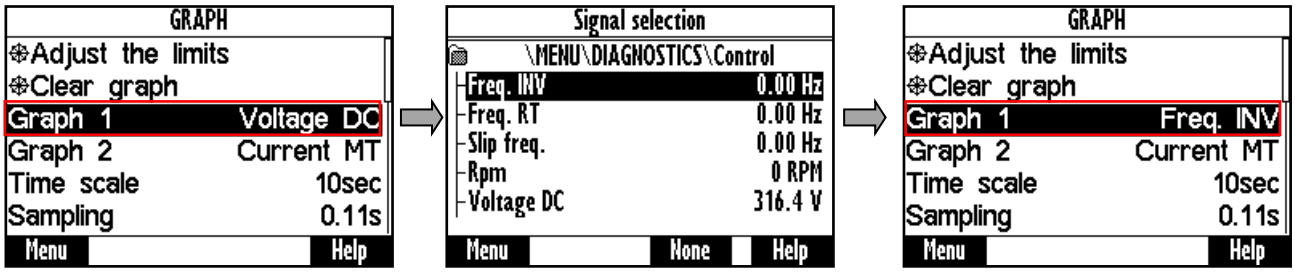
Graph parameters setting – press the F2 key.



Graph window is used to record the course of values of any two parameters (quantities). Their selection can be set in graph parameters settings after pressing F2.

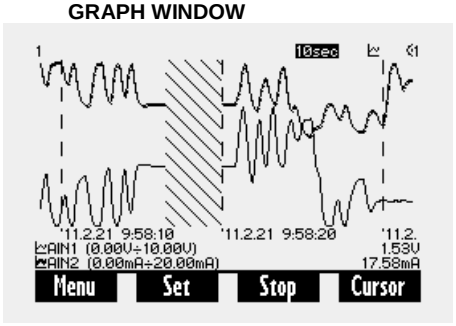
EXAMPLE:

Marked item (Graph 1), confirm with ENTER button. In the window - Signal selection choose the required displayed value and confirm.

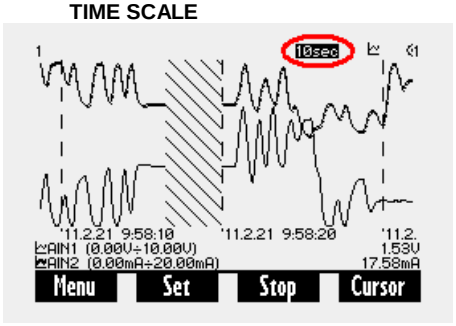


The first graph (Graph 1) is drawn with a thinner line and second graph (Graph 2) with a thicker line. The selected value, the maximum and minimum displayed value is displayed in the bottom part of the graph window on the left side and the current value is displayed on the right side of the window. The graph timestamps are displayed in the line over these variables. The value of the displayed time scale and device status is displayed in the upper part of the graph. .

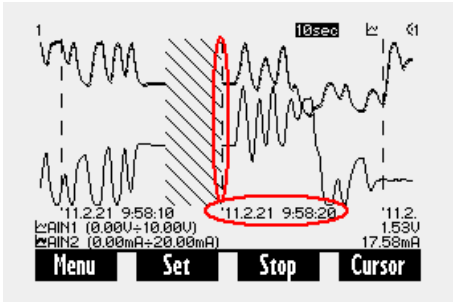
GRAPH WINDOW



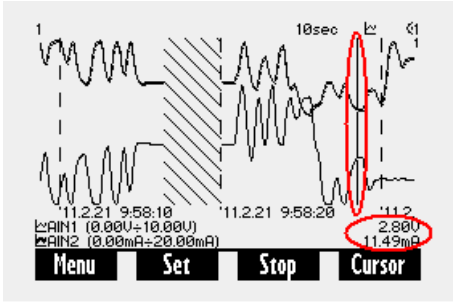
TIME SCALE



TIME TAG



VALUE MONITORING BY USING THE CURSOR



The values of selected signals are stored in the memory with a given selected step size when running the graph (F3-START). The maximum recording time is calculated from the step size. Record continues after you restart the panel (if record was running). The period of time when there is no corresponding record is filled with backslash lines. Graph record is indicated by a graph symbol in device status bar. It is possible to switch to the another window during record and the record runs normally in the background.

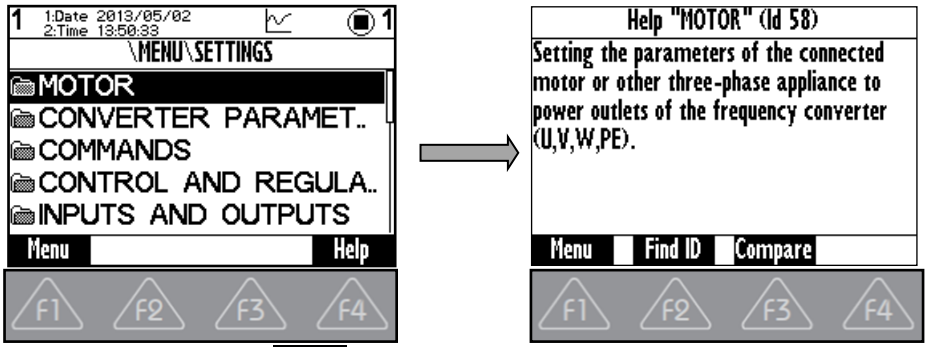
F3 Start, Stop	**Start, stop** of the record into the internal memory according to the options set

F2 Set	Graph options setting **Adjust the limits** – set the cursor in the graph to real time. Graph will be displayed in real time **Clear graph** – deletes the data from the graph **Graph 1, 2** – selection of the recorded signals **Time scale** – size of the displayed section between two timestamps. It can be changed by using arrows up and down in the graph window. **Sampling** – period of updating the values of selected values **Record lenght** – informs about the maximum record, that can fit into memory at the current set sampling **Recording mode** – determines, whether the oldest samples will be overwritten or not after filling the storage memory
F4 Cursor, Record	**Record** – displays the last recorded signal and allows real-time record tracking **Cursor** – allows graph analyzing by using the cursor
◁ ▷ Shift	Cursor position change in the cursor mode

9.9 Parameter search

Each parameter has its own unique ID number. In help window (in most of the windows it is launched by F4), there is button F2 - Find ID. After entering the corresponding ID number, panel founds and displays the parameter.

DISPLAYING HELP FOR THE SELECTED PARAMETER

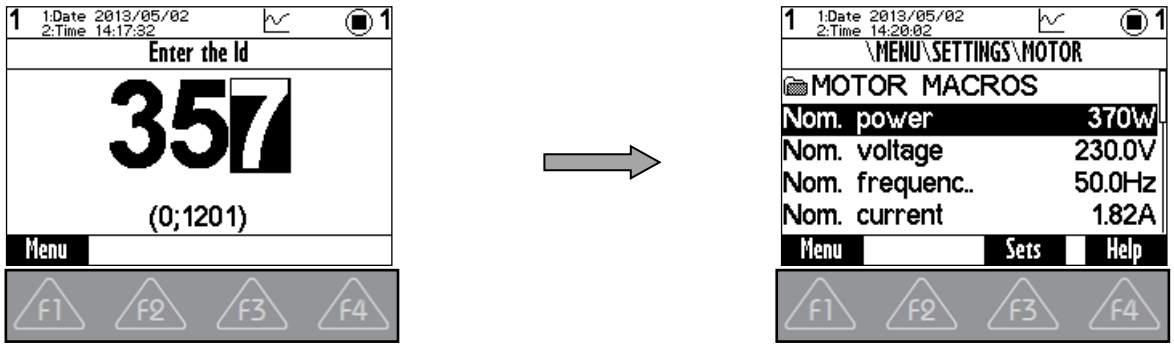


PUSH THE BUTTON F4 TO GET HELP FOR THE SELECTED PARAMETER.

F1 - Návrat do menu

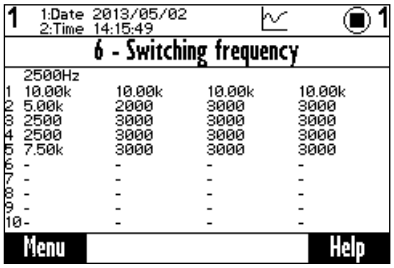
F2 - Button “Find ID”. Possibility to enter IDd of arbitrary parameter and the required parameter is displayed after confirmation (Press the ENTER button).

ID SETTING OF SELECTED PARAMETER REQUIRED PARAMETER IS DISPLAYED AFTER CONFIRMATION



- The button “Compare” is used to compare the setting of the selected parameter in all sets of parameters of the each stored parameter backups. This window can be used to find differences in the settings.

EXAMPLE:



9.10 Device selection for control panel

Each device is identified by its address. It is necessary to set the unique adress of each device before creating a network. If the panel loses its connection with the the converter (change of its address, interruption of the cable,..), then the panel starts to search for the device again. List of devices is displayed in the format „Address of device: Device name“ after searching for available devices. Refresh the search by pressing the 

button**.**