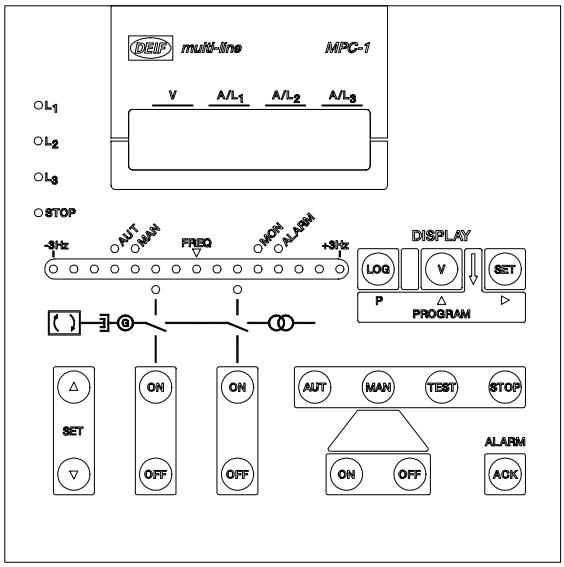
Programming manual

Multi power controller MPC-1

multi-line

4189340103E



- *Complete control system in one package*
  - *Island operation*
  - *Parallel with mains operation*
  - *Emergency generator control*

- *3-phase AC measurements*
- *Calculation of complex AC values*
- *Generator and mains supervision and protection*
- *Prime mover start/supervision/stop*
- *Breaker synchronisation*

CE

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List of contents

This manual relates to software version 1.0x (versions 1.01…1.09)

For further information, see ”User’s manual, multi power” and ”Installation manual, multi power controller MPC-1, ref. No. 4189340102”.

1. Warnings, legal information and notes to CE-marking

This manual gives general guidelines on how to install and operate a gen-set using the product MPC-1. Installing and operating a gen-set implies generation of dangerous current and voltages, and therefore this should be done by qualified personnel only. DEIF takes no responsibility for operation or installation of gen-sets or other systems using the described methods in this manual. If there is any doubt about how to install or operate the gen-set the company responsible for installation or operation must be contacted.

MPC-1 is CE-marked with respect to the EMC directive for residential, commercial and light industry plus industrial environment.

MPC-1 is CE-marked with respect to the low-voltage directive for 300 V class systems, protection class III and pollution degree 2.

Take precautions against electrostatic discharges when service or installation operations are done. The unit is protected against electrostatic discharge in normal operating situations, but service or installation operations can cause unforeseen electrostatic discharges.

2. Parameter setting

In the following, use the blank column "commissioning value" to write down your own settings.

2.1 Select parameter menu

By pushing the buttons "V" and "SET" simultaneously a swap between mode "auto" and "parameter" can be carried out. The functions of the buttons "LOG", "V" and "SET" are changed to the indications below the buttons, i.e. "LOG" turns to "P", "V" turns to "▲" and "SET" turns to "▸". The "auto" LED will flash.

In parameter mode, all set-points and timers can be changed.

If no parameter setting inputs has taken place for 30 secs, the MPC-1 will return to "auto" mode.

To make key-in of values easier, the function is equipped with a "sweep" function. By holding a button down, a fast sweep through values can be carried out.

The first thing shown is the software version. To continue, press "P".

2.1.1 ”P” pushbutton

Stores the keyed in display parameter value, jump to the next parameter.

If the display value has been changed via the "▲" or "▶" buttons, the new value can be stored by pushing the "P" button once. If the button is pushed twice, the display will jump to the next parameter.

2.1.2 "▲" pushbutton

Steps the chosen displayed value up one unit (within allowed limits). Digit is chosen by moving the cursor.

2.1.3 "▶" pushbutton

Analog values: Moves the cursor to the next digit
Binary values: Swap of different functions (e.g.: ON/OFF)

2.2 Software version

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Software version V 1.01			The software version is factory set. Check that it matches the version indicated in the manuals.

2.3 Code number

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Enter code Number xxxx	random and level		The display will show a random no. The random no. is used at a later stage if the chosen passwords have been lost. Call factory for help on the code to be used. NOTE: If you change this no., one of the 2 code level codes must be used (see later). It is therefore recommended, that you leave the no. during programming/commisioning.

2.4 Service display

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Service display ON	ON		OFF/ON. Selection of display of double voltage, frequency and phase angle and relay positions (commissioning help). If ON, the next 3 displays will follow:
Bus:000V 00,00Hz Gen:000V 00,00Hz			Busbar voltage, Busbar frequency Generator voltage, generator frequency
Main:000V 00,00Hz Bus:000V 00,00Hz			Mains voltage, mains frequency Busbar voltage, busbar frequency
Relay: MCB OFF f U GCB OFF			Breaker status: Mains breaker ON/OFF Gen. Breaker ON/OFF Control relays: Freq. UP: f+ Freq. DOWN: f- Voltage UP: U+ Voltage DOWN: U-

While looking at the service display, the frequency indicator (LED horizontal row below the display) will act as a LED synchronoscope, with the sync. point at the centre.

2.5 Mains power setpoints

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Configurate controls YES/NO	NO		Selection of changing power setpoints. If NO the following sub-parameters will not be displayed.

Power controller Pset1 = F0100kW			Setpoint 1 (kW) for constant power transfer to/from mains(B indicates "Consumption from mains", L indicates "Delivery to mains", F indicates fixed generator power). Active setpoint, when "auto 1" (terminal 3) is connected to + 24 VDC.
Power controller Psetp.2 = F0200kW			Setpoint 2 (kW) for constant power transfer to/from mains. Active setpoint, when "auto 2" (terminal 5) is connected to + 24 VDC. NOTE: If "Setpoint extern" = ON (see paragraph 1.8.4), the setpoint 2 input controls the "auto" function only. The actual setpoint is determined via a 4(0)...20 mA transmitter. NOTE: The F, B or L choice must be equal to the F, B or L setting of the analog input zeropoint and fullscale.

If password protection is active, the following requires the ”level 2” password:

2.6 Base settings

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Configurate Base ? YES/NO	NO		Selection of changing base values. If NO the following sub-parameters will not be displayed.

2.6.1 Generator no. (only important with Option E)

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Generator no. 01	01		Generator no. 1-8. Selection of generator no. if more generators are to be controlled by the power management option E.

2.6.2 Generator frequency

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Generator freq. f set. = 50.0 Hz	50.0 Hz		Generator frequency setpoint in island or idle operation 48...62Hz.

2.6.3 Nominal frequency

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Nominal freq. Generator 50.0Hz	50.0 Hz		Generator nominal frequency, parallel running operation 48...62 Hz.

2.6.4 Generator voltage

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Generator volt. U set. = 400 V	400V		Generator nominal voltage in island or idle operation 350...440 V.
Volt.transformer Prim. 10.0kV	10.0 kV		0.5...70 kV. Setting of voltage transformer primary value (voltage transformer version only)
Volt.transformer Sec. 100V	100V		100/110V. Setting of voltage transformer secondary value (voltage transformer version only)

2.6.5 Current transformers and nominal power

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Current transf. Generator 0500/5	0500 /5		.../5 or .../1 A. Generator current transformer primary/secondary nominal current. The size of current transformer must be selected in such a manner, that there, by full generator load, runs min. 40% of nominal current on transformer secondary side. If not, non-correct functions may appear.
Power measuring Gen. Threephase	3-phase		1-phase/3-phase. "1-phase": single phase (phase L1) current used for power and power factor calculation. "3-phase": 3-phase current measurement is used for calculation.
Nominal power Gen. = 0200 kW	0200 kW		5...6900 kW. Nominal power for the generator in question. Max. power limt for the power regulators.
Nominal current Gen. = 0300 A	0300A		0...3000 A. Generator nominal current. Max. current limit for the power regulators.
Current trafo mains 1000/5			.../5 or .../1 A. Single phase mains current is used for options A and F. The size of current transformer must be selected in such a manner, that there, by full generator load, runs min. 40% of nominal current on transformer secondary side. If not, non-correct functions may appear.
Define level 1 Code 0001	0001		User definable password for level 1 (user) access
Define level 2 Code 0002	0002		User definable password for level 2 (programmer) access

2.7 Controller settings

2.7.1 Frequency control relay outputs (standard)

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION

Freq. Controller ON	ON		Frequency controller ON/OFF. "cursor " selects ON/OFF value. "select" enters the chosen value.
Freq.controller Ramp 05Hz/s	05 Hz/s		2...50 Hz/s. Frequency ramp speed
Freq. Controller Nz = 0.10 Hz	0.05 Hz		0.05...1.00 Hz neutral zone. Island operation: Frequency within f nom. ± neutral zone causes no controller action. Dynamic synchronisation: Max. differential frequency = neutral zone value.
Freq. Controller Time pulse>080ms	065 ms		10...250 ms. Min. impulse time for controller relay outputs. Min. Time required for the engine governor to react on impulse.
Freq. Controller Gain.Kp = 15.0	15.0		1.0...99.9 amplification factor for frequency controller. The Kp affects the ON time for the relay output. Kp ↑ = ON time ↑.

2.7.2 Frequency controller analog output (Option B1/B3)

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Base pos. freq. 10%	10%		0...50 %. Idle run genset frequency at startup. Relates to system base frequency.
P-amplification f Kpr 100	100		0...500. P-band factor for controller function
Delay time f Tn 02.5s	02.5s		0...99s. I-time factor for controller

2.7.3 Voltage controller relay outputs (standard)

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Volt. controller ON	ON		Voltage controller ON/OFF. "cursor " selects ON/OFF value. "select" enters the chosen value.

Volt. controller Nz = 20 V	01.0V		4...60 V (1...20 V) neutral zone. (../110(100) V version: The voltage refers to secondary side of voltage transformer). Island operation: Voltage within U nom. ± neutral zone causes no controller action. Dynamic synchronisation: Max. Differential voltage = neutral zone value.
Volt. controller Time pulse>080ms	065ms		10...250 ms. Min. Impulse time for controller relay outputs. Min. time required for the generator AVR to react on impulse.
Volt. controller Gain Kp = 10.0	15.0		1.0...99.9 amplification factor for frequency controller. The Kp affects the ON time for the relay output. Kp ↑ = ON time ↑.

2.7.4 Voltage controller analog output (Option B2/B3)

DISPLAY	Factory set	Commissioning value	DESCRIPTION
P-amplification V Kpr 100	100		0...500. P-band factor for controller function
Delay time V Tn 02.5s	02.5s		0...99s. I-time factor for controller

2.7.5 Constant power controller and external setpoint

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Power controller ON			ON/OFF. ON: In parallel with mains, the generator will maintain a constant power production.
Power controller Ramp=010kW/s	010 kW/s		5...100 kW/s. Ramp speed for power controller.
Power limit Pmax.= 120 %	100%		10...120%. Power controller upper limit value, referring to generator nominal power. Upper limit, to prevent overload, e.g when running constant power from mains (peak shaving, option F).

Power limit Pmin. = 0...50 %	00%		0...50%. Power controller lower limit value, referring to generator nominal power. Lower limit, to prevent low load running when running constant power from mains (peak shaving, option F).
Power set point External OFF	OFF		ON/OFF. Selection of external set point via analog input no. 1 (terminal 93-94).
If power set point external = ON, the following displays will occur:			
Analog input 0.20mA	0-20mA		0/4-20 mA input type celection
Ext setpoint 0(4)mA =F0000kW			Zeropoint and fullscale for External setpoint. F = Fixed generator load B = Power import from mains (option F only) L = Power export to mains (option F only)
Ext. Setpoint 20 mA = F0200kW			
RS232 control OFF	OFF		ON/OFF. Selection of command and setpoint settings via RS232 interface (Option D only)
Power controller Nz = 05.5%	02.5%		0.5...25.5%. Neutral zone, active power controller, percentage of generator nominal power. In parallel with mains, the active power will be within Pset ±Nz.
Power contr. Gain Kp = 10.0	05.0		1.0...99.9. Amplification factor, active power controller. The Kp affects the ON time for the relay output. Kp ↑ = ON time ↑.
Power contr. Sens.red. * 2.0	*2.0		1.0...99.9. After reach of setpoint, there will be a delay of min. 5 s before any command pulse is set i.e. the sensitivity is reduced. Example: With a Nz of 2.5% and Sens.red of 2.0, the Nz will, for 5 s, be raised to 5%. After this, if actual value is within 5%, Nz returns to 2.5%. This prevents hunting of the controller.

Part load start setp. = 015%			0...100%. If the generator needs warming-up before taking load after synchronisation, this setpoint can be used.
Part load start time 005s			0...600s. Running time for warming-up

2.7.6 Active power load sharing

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Active power Load-share ON	ON		ON/OFF. If a parallel run with other generators is to take place, this value must be ON. Otherwise, the genset will not take part of the load sharing
Loadsharing Factor 50%	50%		0...100%. The load sharing factor determines the stability of the main control parameter (in island operation: Frequency, in parallel with mains: Power transport value). Higher value =more stable primary parameter value, less stable generator active load (load sharing stability) and vice versa.

2.7.7 Reactive power load sharing

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Reactive power Load-share ON	ON		ON/OFF. If a parallel run with other generators is to take place, and reactive power loadsharing is to take place, this value must be ON. Otherwise, the genset will not take part of the reactive power load sharing

Loadsharing Factor 50%	50%		0...100%. The load sharing factor determines the stability of the main control parameter (in island operation: Voltage, in parallel with mains: Reactive Power transport value). Higher value =more stable primary parameter value, less stable generator reactive load (load sharing stability) and vice versa.

2.7.8 Breaker configuration

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Configurate Breaker? YES	YES		YES/NO. If NO is chosen, the following sub-menus will not be shown.
Synchronize functions ON	ON		ON/OFF. If off is chosen, synchronisation will not take place.
Synchronize df max. = 0.18 Hz	0.18Hz		0.05...0.45 Hz (positive slope). Generator frequency must be busbar frequency + 0...df max. to obtain dynamic synchronisation.
Synchronize df min. = -0.10 Hz	-0.10Hz		0.00...-0.30 Hz (negative slope). Generator frequency must be busbar frequency -0...df min. to obtain dynamic synchronisation. Used at return sync to mains af
Synchronize dU max. = 20 V	16V		4...60 V. Max. Allowable differential voltage by closing of breaker. ../100 or ../110 V voltage transformer versions: The value refers to voltage transformer secondary side.
Synchronize time pulse>200 ms	200ms		050...250 ms Min. Time duration of breaker close command relay output.
Gen. Breaker Closing t.=050 ms			40...250 ms. Generator breaker time.
Gen. Breaker Constant ON	OFF		ON/OFF. ON: breaker close signal in constant when ON. OFF: Generator breaker close signal is a pulse.
Mains breaker Closing t.=050 ms	080ms		40...250 ms. Mains breaker (option A) time.

G.break.blackout Operation ON	ON		ON/OFF. Selects generator breaker blackout start active when ON
G.break.blackout df max.= 0.25Hz	0.25hz		0.05...0.49Hz Blackout start frequency deviation.
G.break.blackout dU max. = 40V	40V		2...60 V. Blackout start undervoltage
m.break.blackout operation ON	ON		ON/OFF. Blackout start, mains breaker (option A).
Sync. Time contr. ON	ON		ON/OFF. Supervision of synchronisation time of breakers
Mains trip via GCB	GCB		GCB/MCB. Choice of trip of gen. breaker (GCB) or mains breaker (MCB) if a mains failure occurs.
Sync time contr. ON	ON		ON/OFF. Choise of synchronisation time supervision
Sync. Time contr. Delay time 180s	120s		0...999s. Set-point of synchronisation timer. At runout, alarm "Sync. Time" and horn output is released.

2.7.9 Emergency power

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Config. emer. Power? YES	YES		YES/NO. If NO is chosen, the following sub-menus will not be shown.
Emer.power ON	ON		ON/OFF. ON: Upon mains fail, the genset is started and used as emergency power source.
Emergency power start delay 15s	03s		0...99s. Start delay after mains failure occurs.
Main Delay time 15s	03s		0...99s. Delay after mains restoration before re-synchronising.
Emergency power stop delay 10s	20s		0...99s. Stop delay after mains restored. Emergency power supply running time after return of the mains.

2.7.10 Power factor controller

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Power-factor-Controller ON			ON/OFF. ON: Running parallel with mains, the power factor will be kept at preset value, regardless of power consumption. By very low loads (secondary current <5% I_n), the control can become unstable. Therefore, in this case, the controller is overruled.
Pow.fact. contr. Setpoint.= i 0.95			1...i 0.70 (i = inductive) The reactive power is controlled in such a manner, that the preset power factor value is kept constant.
Pow.fact.contr. Nz = 10.0%			0.5...25.5%. Neutral zone, power factor controller, percentage of generator nominal power. The MGC-1 calculates the reactive power value necessary to reach the desired power factor. In parallel with mains, the reactive power will be within ($P_{nom.}$ ±Nz)*cos .
Pow.fact.contr. Gain. Kp = 10.0			1.0...99.9. Amplification factor, power factor controller. The Kp affects the ON time for the relay output. Kp ↑ = ON time ↑.

3. Generator and engine protection parameter menu

The protective functions are divided into 4 failure modes:

F0: Warning. Gives warning only, no interference with the present running situation.
F1: As F0, but with setting of alarm output : Common failure.
F2: Stop. Trips breaker and stops genset after cooling down time.
F3: Shutdown. Trips breaker and stops genset immediately.

By activation of "shutdown inhibit mode" (terminal 6), functions F2 and F3 are changed to F1 (shutdown blocking)!!!

3.1 Generator reverse power/overload protection

SETTING DISPLAY	Factory set	Commissioning value	ALARM MESSAGE	DESCRIPTION
Config Alarms? YES	YES			YES/NO. If NO is chosen, the following sub-menus will not be shown.
Reverse power/ overld. mon. ON	ON			ON/OFF. Set supervision of reverse power and overload ON or OFF.
Reverse power/ Min. Power=-10%	-10%			-99...0...+99%. Reverse/underload setpoint referring to generator nominal power.
Reverse power delay= 3.0 s	5.0s		F2: Reverse power	0...9.9 s. Reverse power trip delay. After timer runout, the GCB is tripped and genset is stopped after cooling down period.
Gen.- overload Setpoint =110%	120 %			80...120 %. Overload setpoint referring to generator nominal power.
Gen.-overload delay = 20s	15s		F2: Overload	0...99 s. Overload trip delay. After timer runout, the GCB is tripped and genset is stopped after cooling down period.

3.2 Asymmetric load monitoring

SETTING DISPLAY	Factory set	Commissioning value	ALARM MESSAGE	DESCRIPTION
Asymmetric load Monitoring ON	ON			ON/OFF. Set supervision of asymmetric load ON or OFF.
Asymmetric load Max. =050%	050 %			0...100%. Setpoint for asymmetric load trip.
Asymmetric load Delay= 3.0 s	1.0s		F2: Asymm load	0...9.9 s. Trip delay. After timer runout, the GCB is tripped and genset is stopped after cooling down period.

3.3 Generator frequency monitoring

SETTING DISPLAY	Factory set	Commissioning value	ALARM MESSAGE	DESCRIPTION
Gen. Frequency Monitoring ON	ON			ON/OFF. Select generator frequency supervision ON/OFF.
Gen. Overfreq. f > 53.0 Hz	55.-0Hz		F3: Overspeed	40...70Hz. Overfrequency setpoint.
Overfreq. Delay= 2.0 s	0.30s			0...9.9 s. Over frequency trip delay. After timer runout, the GCB is tripped and genset is stopped immediately.
Gen. Underfreq. f < 45.0 Hz	45.0Hz		F3: Underspeed	40...70Hz.Underfrequency setpoint.
Underfreq. Delay = 3.0s	0.50s			0...9.9 s. Underfrequency trip delay. After timer runout, the GCB is tripped and genset is stopped immediately.

3.4 Generator overcurrent protection

SETTING DISPLAY	Factory set	Commissioning value	ALARM MESSAGE	DESCRIPTION
Overcurrent Monitoring ON	ON			ON/OFF. ON = Overcurrent monitoring active.
Overcurrent Limit =160%	160%		F2: Overcurrent	0...160%. Overcurrent monitoring setpoint referring to generator nominal current.
Overcurrent Delay = 00,-02s	00,02			0...99,99. Overcurrent trip delay timer.

3.5 Generator 3-phase voltage monitoring

SETTING DISPLAY	Factory set	Commissioning value	ALARM MESSAGE	DESCRIPTION
Gen. voltage-Monitoring ON	ON			ON/OFF. Select generator voltage supervision ON/OFF.
Gen. Overvoltage U > 440 V	430V			300...480 V (75...135V using voltage transformers). Overvoltage setpoint.
Gen. Overvoltage Delay= 0.1 s	0.30s		F3: Gen. overvolt.	0...9.9 s. Over voltage trip delay. After timer runout, the GCB is tripped and genset is stopped immediately.
Gen. Undervoltage U < 380 V	360V			300...480 V (75...135V using voltage transformers). Undervoltage setpoint.
Gen. Undervoltage Delay = 0.1s	0.50s		F3: Gen. undervolt.	0...9.9 s. Undervoltage trip delay. After timer runout, the GCB is tripped and genset is stopped immediately.

3.6 Mains frequency supervision

SETTING DISPLAY	Factory set	Commissioning value	ALARM MESSAGE	DESCRIPTION
Mains frequency Supervision ON	ON			ON/OFF. Select mains voltage supervision ON/OFF.
Mains overfreq. f > 50.20 Hz	50.20Hz			40.00...70.00Hz. Mains overfrequency alarm setpoint
Overfreq. Delay= 0.1 s	0.06s		F3: Mains Overfreq.	0...9.9 s. Over frequency trip delay. After timer runout, the GCB (MCB if option A is chosen) is tripped.
Mains underfreq. f < 49.80Hz	49.80Hz			40.00...70.00Hz. Mains underfrequency alarm setpoint

Underfreq. Delay = 0.1s	0.06s		F3: Mains under- volt.	0...9.9 s. Underfrequency trip delay. After timer runout, the GCB (MCB if option A is chosen) is tripped.

3.7 Mains 3-phase voltage supervision

In parallel with mains, this function is essential. Should a mains failure occur, the parallel running generator **must** be disconnected from the mains. Dependent on the modes chosen, the genset will be switched into idle run or emergency power run.

SETTING DIS-PLAY	Factory set	Commis-sioning value	ALARM MES-SAGE	DESCRIPTION
Mains voltage Supervision ON	ON			ON/OFF. Select mains frequency supervision ON/OFF.
Mains. over-volt. U > 440 V	430V			300...480 V (75...135V using voltage transformers). Overvoltage setpoint.
Mains overvolt. Delay= 0.1 s	0.06s		F3: Mains Over- volt.	0...9.9 s. Over voltage trip delay. After timer runout, the GCB (MCB if option A is chosen) is tripped.
Mains under-volt. U < 380 V	360V			300...480 V (75...135V using voltage transformers). Undervoltage setpoint.
Mains undervolt. Delay = 0.1s	0.06s		F3: Mains under- volt.	0...9.9 s. Undervoltage trip delay. After timer runout, the GCB (MCB if option A is chosen) is tripped.

3.8 Vector jumping monitoring

SETTING DIS-PLAY	Facto-ry set	Commis-sioning value	ALARM MES-SAGE	DESCRIPTION
Vector jump Monitoring ON	ON			ON/OFF. Select vector jump supervision ON/OFF.

Max. phase-Difference 12°	12°			3...30°. Max. phase difference setpoint.
Trip vector jump After 2 periods	2 periods		F3: Vector jump	2...4 periods. Trip time of GCB (MCB if option A is chosen).
Monitoring Single phase	single phase			Single phase/three phase. Selection of 1/3-phase vector jump supervision

3.9 Battery voltage

SETTING DISPLAY	Factory set	Commissioning value	ALARM MESSAGE	DESCRIPTION
Batt. Undervolt. U< = 23.5V	18.0V		F1: batt. undervolt.	18.0...30.0 V. Battery voltage low limit. Fixed delay 20 sec.

NOTE: Regardless of setting, the alarm will occur if:
Voltage drops below 12.7 V (without running start motor)
- Voltage drops below 13.5 V (with running start motor)

4. Aux inputs parameter menu

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Config Inputs? YES	YES		YES/NO. If NO is chosen the following sub-parameters will not be shown.

4.1 Relay manager

DISPLAY	Factory set	Commision-ing value	DISPLAY	Factory set	Commision-ing value
Config relay 1: 01	01		Config relay 4: 01	01	
Config relay 2: 01	01		Config relay 5: 01	01	
Config relay 3: 01	01				

Possible configurations: See next page.

The aux. relays can be chosen to give signal (close) according to the following parameters:

01:	Fail type 1 (warning)	28:	Limit, analog input 7 (Pt100 2), warning
02:	Fail type 2 (soft stop)	29:	Limit, analog input 1 (P setpoint), alarm
03:	Fail type 3 (shutdown)	30:	Limit, analog input 2, alarm
04:	Firing speed reached	31:	Limit, analog input 3, alarm
05:	Mains fail	32:	Limit, analog input 4, alarm
06:	Battery voltage	33:	Limit, analog input 5 (PTC), alarm
07:	Auto running mode ON	34:	Limit, analog input 6 (Pt100 1), alarm
08:	Hand running mode ON	35:	Limit, analog input 7 (Pt100 2), alarm
09:	Test running mode ON	36:	Digital input, term 34
10:	Stopped by operator	37:	Digital input, term 35
11:	Generator undervoltage	38:	Digital input, term 36
12:	Generator overvoltage	39:	Digital input, term 61
13:	Underspeed	40:	Digital input, term 62
14:	Overspeed	41:	Digital input, term 63
15:	Overcurrent	42:	Digital input, term 64
16:	Sync. Fail	43:	Digital input, term 65
17:	Start fail	44:	Digital input, term 66
18:	Asymmetric load	45:	Digital input, term 67
19:	Overload	46:	Digital input, term 68
20:	Reverse power	47:	Digital input, term 69
21:	Unit ready	48:	Digital input, term 70
22:	Limit, analog input 1 (P setpoint), warning	49:	Digital input, term 71
23:	Limit, analog input 2, warning	50:	Digital input, term 72
24:	Limit, analog input 3, warning	51:	Digital input, term 73
25:	Limit, analog input 4, warning	55:	Common alarm
26:	Limit, analog input 5 (PTC), warning	56:	Common shutdown
27:	Limit, analog input 6 (Pt100 1), warning	57:	Engine running

The relays are capable to handle up to 3 messages in a logic manner, using the following operators:

+ = OR * = AND - = NOT

Examples:

Functions	Description

22	Relay closes when function 22
-22	Relay opens when function 22
2*22	Relay closes only when func. 2 and 22
2+22	Relay closes if func. 2 or 22 or both
3+5+13	Relay closes when not func. 5 and func. 3 or func 13 or both
4+7+11	Relay closes when func. 4 or 7 or 11 or a combination
-4*-7*-11	Relay opens when func. 4 and 7 and 11
4*7*11	Relay closes when func. 4 and 7 and 11
-4+-7+-11	Relay opens when func. 4 or 7 or 11 or a combination

4.2 Digital input

The digital inputs are made with full flexible functionality, i.e. any channel can be selected to give a warning, a normal stop or a shutown. This means, that they are very suited for engine supervision for e.g. lubricating oil pressure, water temperature, external trip devices etc.

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Dig. input 1234 Function EDEE	EEEE	EEEE	Digital inputs 1 to 4 E = Energised or D = De-energised.
Dig. input 1234 Delay YYNY	NNNN		Digital inputs 1 to 4 Y = delay Yes or N = delay No
Dig. input 1234 Failclass 3012	1111		Function, digital inputs 1 to 4. 0: Warning. Gives warning only, no interference with the present running situation. 1: As F0, but with setting of alarm output : Common failure. 2: Stop. Trips breaker and stops genset after cooling down time. 3: Shutdown. Trips breaker and stops genset immediately.
Dig. input 5678 Function EDEE	EEEE		Digital inputs 5 to 8 E = Energised or D = De-energised.
Dig. input 5678 Delay YYNY	NNNN		Digital inputs 5 to 8 Y = delay Yes or N = delay No

Dig. input 5678 Failclass 3012	1111		Function, digital inputs 5 to 3. 0: Warning. Gives warning only, no interference with the present running situation. 1: As F0, but with setting of alarm output : Common failure. 2: Stop. Trips breaker and stops genset after cooling down time. 3: Shutdown. Trips breaker and stops genset immediately.
Dig. input 9ABC Function EDEE	EEEE		Digital inputs 9 to 12 E = Energised or D = De-energised.
Dig. input 9ABC Delay YYNY	NNNN		Digital inputs 9 to 12 Y = delay Yes or N = delay No
Dig. input 9ABC Failclass 3012	1111		Function, digital inputs 9 to 12. 0: Warning. Gives warning only, no interference with the present running situation. 1: As F0, but with setting of alarm output: Common failure. 2: Stop. Trips breaker and stops genset after cooling down time. 3: Shutdown. Trips breaker and stops genset immediately.

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Dig. input DEGF Function DDDD	E		Digital input 13. E = Energised or D = De-energised.
Dig. input DEFG Delay NNNN	N		Digital input 13. Y = delay Yes or N = delay No
Dig. input DEFG Failclass 3333	1		Function, digital input 13. 0: Warning. Gives warning only, no interference with the present running situation. 1: As F0, but with setting of alarm output : Common failure. 2: Stop. Trips breaker and stops genset after cooling down time. 3: Shutdown. Trips breaker and stops genset immediately.

4.3 Analog input

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Analog input 2 ON	ON		ON/OFF. Selection of analog input.
Name and unit Analog 2 0000			Analog 2: Can be replaced with any name. Place cursor under letter in question and push "▲" 0000 : Can be replaced with any name (e.g. bar). Place cursor under number in question and push "▲".
Value at 0 % 0000	0000		Zeropoint setpoint
Value at 100% 0060	0060		Fullscale setpoint
Limit warning Value = 1000	1000		0...9994. Limit for warning
Limit shutdown Value = 1002	1002		0...9999 Limit for shutdown
Delay = 001s	001s		0...999s. Delay for both warning and shut-down.
Monitoring: High limit mon.	High		High limit mon./low limit mon. Selection of high or low limit monitoring.

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Analog input 3 ON	ON		ON/OFF. Selection of analog input.
Name and unit Analog 3 0000			Analog 3: Can be replaced with any name. Place cursor under letter in question and push "digit▲" 0000 : Can be replaced with any name (e.g. bar). Place cursor under number in question and push "digit▲".

Value at 0 % 0000	0000		Zeropoint setpoint
Value at 100% 0060	0060		Fullscale setpoint
Limit warning Value = 1000	1000		0...9994. Limit for warning
Limit shutdown Value = 1002	1002		0...9999 Limit for shutdown
Delay = 001s	001s		0...999s. Delay for both warning and shut-down.
Monitoring: High limit mon.	High		high limit mon./low limit mon. Selection of high or low limit monitoring.
Analog input 4 ON	ON		ON/OFF. Selection of analog input.
Name and unit Analog 4 0000			Analog 4: Can be replaced with any name. Place cursor under letter in question and push "digit▲ " 0000 : Can be replaced with any name (e.g. bar). Place cursor under number in question and push "digit▲".
Value at 0 % 0000	0000		Zeropoint setpoint
Value at 100% 0060	0060		Fullscale setpoint
Limit warning Value = 1000	1000		0...9994. Limit for warning
Limit shutdown Value = 1002	1002		0...9999 Limit for shutdown
Delay = 001s	001s		0...999s. Delay for both warning and shut-down.
Monitoring: High limit mon.	High		high limit mon./low limit mon. Selection of high or low limit monitoring.

4.4 Temperature inputs

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Analog input 5 ON	ON		ON/OFF. Selection of temperature 1 input ON/ OFF. PTC type 0...15 k .
Name and unit Gen PTC 000%			Fixed value.
Value at 0 % 0000	0000		Zeropoint setpoint
Value at 100% 0060	0060		Fullscale setpoint
Limit warning Value = 1000	1000		0...9994. Limit for warning
Limit shutdown Value = 1002	1002		0...9999 Limit for shutdown
Delay = 001s	001s		0...999s. Delay for both warning and shutdown.
Monitoring: High limit mon.	High		high limit mon./low limit mon. Selection of high or low limit monitoring.
Temperature 6 Pt100 ON			
name* Pt 100 1 000^{o}C			
Limit warning = 092^{o}C			0...255^{o}C.
Limit shutdown = 102^{o}C			0...255^{o}C.
Delay = 001s	001s		0...999s. Delay for both warning and shutdown.
Monitoring: High limit mon.	High		high limit mon./low limit mon. Selection of high or low limit monitoring.

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Temperature 7 Pt100 ON			
name* Pt 100 2 000^{O}C			
Limit warning = 092^{O}C			0...255^{O}C.
Limit shutdown = 102^{O}C			0...255^{O}C.
Delay = 001s	001s		0...999s. Delay for both warning and shut-down.
Monitoring: High limit mon.	High		high limit mon./low limit mon. Selection of high or low limit monitoring.

4.5 Analog output manager (not available if Option E is chosen)

DISPLAY	Factory set	Commis-sioning value	DESCRIPTION
Analog out X1X2 Parameter = 01	01		Parameter codes: see below
Analog out X1X2 0% = 0000			0...9994. Value equal to 0/4mA output.
Analog out X1X2 100% = 0000			0...9994. Value equal to 20mA output (NO-TE: For frequency output, key in value equ-al to f x 100. The output cannot handle de-cimals).
Analog out X4X5 Parameter = 01			
Analog out X4X5 0% = 0000			0...9994. Value equal to 0/4mA output.

Analog out X4X5 100% = 0000			0...9994. Value equal to 20mA output (NOTE: For frequency output, key in value equal to f x 100. The output cannot handle decimals).

Parameters: See next page.

The following parameters are available:

Parameter no.	Function	Description
00	No output	
01	Generator power	0% = Lowest power (kW). Can be negative. 100% = Highest power (kW)
02	Generator cos (-070...+070)/100	0% = Lowest factor, e.g. –010 equals -0.1 100% Highest factor, e.g. 010 equals +0.1
03	Generator frequency (Hz*100)	0% = Lowest value, e.g. 0000 equals 00.00 Hz 100% = Highest value, e.g. 7000 equals 70.00 Hz
04	Generator reactive power	0% = Lowest value (kvar). Can be negative 100% = Highest value.
05	Available power for parallel running generators	0% = Lowest value (kW). Can be negative 100% = Highest value.
06	Total power for parallel running generators	0% = Lowest value (kW). Can be negative 100% = Highest value.
07	Temperature T1 (^{o}C) term. 108-110	0% = Lowest value, e.g. 0000 equals 000 ^{o}C. 100% = Highest value, e.g. 0255 equals 255 ^{o}C
08	Temperature T2 (^{o}C) term. 111-113	0% = Lowest value, e.g. 0000 equals 000 ^{o}C. 100% = Highest value, e.g. 0255 equals 255 ^{o}C
09	Temperature T1 (^{o}F) term. 108-110	0% = Lowest value, e.g. 0000 equals 000 ^{o}F. 100% = Highest value, e.g. 0255 equals 255 ^{o}F
10	Temperature T2 (^{o}F) term. 108-110	0% = Lowest value, e.g. 0000 equals 000 ^{o}C. 100% = Highest value, e.g. 0255 equals 255 ^{o}F

5. Digital inputs, texts

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Alarm txt term.34 Emergency Stop	EMER. STOP		Text fixed
Alarm txt term.35 Terminal 35	EMER. STOP		
Alarm txt term.36 Terminal 36	EMER. STOP		
Alarm txt term.61 Loss of mains	Loss of mains		Text fixed
Alarm txt term.62 Loss of mains	MAINS FAIL		Text fixed
Alarm txt term.63 Term 63	Term. 63		Text configurable
Alarm txt term.64 Term 64	Term. 64		Text configurable
Alarm txt term.65 Term 65	Term. 65		Text configurable
Alarm txt term.66 Term 63	Term. 63		Text configurable
Alarm txt term.67 Term 64	Term. 64		Text configurable
Alarm txt term.68 Term 65	Term. 65		Text configurable
Alarm txt term.69 Term 63	Term. 63		Text configurable
Alarm txt term.70 Term 64	Term. 64		Text configurable
Alarm txt term.71 Term 65	Term. 65		Text configurable
Alarm txt term.72 Term 63	Term. 63		Text configurable
Alarm txt term.73 Term 64	Term. 64		Text configurable

6. Start/stop sequences parameter menu

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Config Motor? YES	YES		YES/NO. If NO is chosen the following sub-parameters will not be shown.

6.1 Option E and F: Load sharing

This function carries out equal load sharing between all generators connected to a common busbar. The function is active in these running modes: Island operation, parallel with mains and synchronisation between mains and generator's busbar.

Parallel with mains with power transport control (constant power to mains / constant power from mains ~ peak lopping, option F): Each of the generators running carries out equal load sharing, while the main parameter (power transport value) is held at a constant level.

Should one of the running generators have a "fixed value" setpoint (F=fixed value), this generator will no longer participate in the load sharing.

Island operation: The main parameter (frequency) is held constant.

Option F: The generator can be started/stopped automatically dependent on the mans power transport. The main purpose is to prevent generator set running, if the generator delivered power lies in a bad working area for the engine (e.g. 5% load, bad efficiency). By setting the values correctly, a good hysteresis can be achieved, thus preventing too often start/stop of the genset, if power demand is close to the limits. ON or OFF can be overruled by setting the value to "000"

Function: If a constant mains transport value (power to mains or from mains) is set, the MPC-1 will calculate the generator power setpoint. If this calculated value becomes bigger than the value "ON load mains" and the "ON delay mains" timer runs out, the genset will be started and synchronised, and take load up to the setpoint (requires one of the setpoints "auto 1" or "auto 2" to be ON). The MPC-1 will at all times keep mains transport constant by changing generator power if total power consumption changes. If the setpoint drops below the "OFF load mains" value and the "OFF delay mains" timer runs out, the genset will be deloaded, GCB will be opened and, after cool down time runout, the genset will be stopped.

All the MPC-1 units are communicating via a twisted pair communication line. The actual generator power (secondary contol parameter) is communicated via the twisted pair, and the load sharing is carried out.

NOTE: If load sharing is to be successful, the parameters "Nominal frequency" and "Parallel run ON" must be set to equal value in all MPC-1 units.

DISPLAY	Factory set	Commissio-ning value	DESCRIPTION
Load dependent Start/stop ON	ON		ON/OFF. If a parallel run with other generators is to take place, this value must be ON. Otherwise, the genset will not take part of the load sharing
Start point Gen. 0015kW	15kW		Lowest possible load of generator for starting. Prevents idle parallel running.
Start delay 005s	5s		Delay before start based on start point.
Hysteresis Main/Isl.op. 005kW	5kW		0...999 kW. Stop of running generator point if available power is increasing.
Available power Main op.0030kW	0030		0...6900 kW. Available power start point for next generator when generators are running parallel with mains operation.
Startpriority (0=run.hours) 00	00		0..8. Start priority of the genset in question. 0 selects start priority based on running hours, other gives the actual priority no.
Available power Island op.0030kW	0030		0...6900 kW. Available power start point for next generator when generators are running parallel in island operation.
Start delay Island op. 001s	001s		0...999s. Start delay timer, start on available power low condition.
Stop delay Island op. 001s	001s		0...999s. Stop delay timer

6.2 Diesel/gas engine selection

DISPLAY	Factory set	Commissioning value	DESCRIPTION
Start-stop-Logic For dieselengine	Diesel		Dieseleng/gasengine. Choice of start sequence for diesel or gas engine. If "diesel" is chosen, the "running coil" (terminal 43-44) will be activated during running and the "preglow" (terminal 37-38) will be activated before and during start. If "gas" is chosen, the "ignition" (terminal 37-38) and the "gas valve" (terminal 43-44) will be activated after run out of delay timer (see later).

6.3 Start sequence, diesel engine

DISPLAY	Factory Set	Commissioning vaue	DESCRIPTION
Preglow time 05 s	05s		0...99s. Preglow time before start (terminal 37-38). After timer runout, the start motor is engaged until firing speed is reached. Preglow continues until firing speed.
Starter time 03 s	05s		0...99 s. Start motor engagement time.
Start pause time 10s	10s		1...99 s. Delay between start attempts.
Gov. Down bef. Start OFF	OFF		ON/OFF. If ON is chosen, a 4 sec. signal "speed down" will be sent to governor, before start is attempted.
Start/stop logic Running relay	Running relay		Running Coil/Stop coil. Selection between start/stop logic via running coil or stop coil.

6.4 Start sequence, gas engine

DISPLAY	Factory Set	Commissioning value	DESCRIPTION
Ign. Delay 0.5 s	03s		0...99 s. Delay of ignition after engagement of start motor.

Gas delay 08 s	21s		0...99 s. Delay of gas supply after engagement of start motor. Must be a few seconds longer as the "Ign. delay".
Starter time 03 s	05s		0...99 s. Start motor engagement time.
Start pause time 10 s	10s		1...99 s. Delay between start attempts.
Gov. Down bef. Start OFF	OFF		ON/OFF. If ON is chosen, a 4 sec. signal "speed down" will be sent to governor, before start is attempted.

6.5 Common start/stop sequence, diesel or gas engine

DISPLAY	Factory Set	Commissioning value	DESCRIPTION
Cool down time 180 s	030s		0...800 s. Cool down time (idle run) after normal stop or fail with class F2. Timer starts when generator breaker is opened.
Monitoring Delay 15 s	08s		1...99 s. Time delay from firing speed is reached until engine alarm and shutdown functions are activated.
Firing speed Reached: f> 15Hz	15Hz		15...70 Hz. Firing speed selection, related to generator frequency.
Pickup ON	ON		ON/OFF. Selects if the speed pickup input is to be active. if NO the firing speed detection will use the generator frequency.
Nom. Speed Gen. 1/min 1500	1500		0...5000. Nominal generator RPM.
Pickup: Number of cogs 0030	0030		0...9999. No of cogs (teeth) on the flywheel (normal pickup measuring point).
Mains break. Free Start engine ON	ON		ON/OFF. If ON and "Auto 1" or "Auto 2" is activated, the engine will start automatically and close the generator breaker if the "mains breaker free" input is switched OFF. This enables automatic island operation during mains failure.

6.6 Counter settings

Set counters ? YES	YES	YES/NO. If NO is chosen the following sub-parameters will not be shown.
Service interval in 0300 h		Running hours between message "F1: Service".
Runn.hour.-count Set 0000 h	00000h	Pre-adjustment of running hours counter. NOTE: Can only be adjusted by authorised service personnel.
Start counter Set 0000	00000	Pre-adjustment of start counter. NOTE: Can only be adjusted by authorised service personnel.

Errors and changes excepted