DEIF

-power in control

CE

COMMUNICATION PROTOCOL

Modbus communication
ECU 100/GCU 100

- Description of options
- Data tables
- Parameter tables

DEIF A/S · Frisenborgvej 33 · DK-7800 Skive
Tel.: +45 9614 9614 · Fax: +45 9614 9615
info@deif.com · www.deif.com

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1. Delimitation

1.1 Scope of feature

This description of options covers the following products:

ECU ver. 110	SW version 1.xx.x or later
GCU ver. 111/112/113	SW version 1.xx.x or later

2. General information

2.1 Warnings, legal information and safety

2.1.1 Warnings and notes

Throughout this document, a number of warnings and notes with helpful user information will be presented. To ensure that these are noticed, they will be highlighted as follows in order to separate them from the general text.

Warnings

Warnings indicate a potentially dangerous situation, which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.

Notes

Notes provide general information, which will be helpful for the reader to bear in mind.

2.1.2 Legal information and disclaimer

DEIF takes no responsibility for installation or operation of the generator set. If there is any doubt about how to install or operate the engine/generator controlled by the Multi-line 2 unit, the company responsible for the installation or the operation of the set must be contacted.

The Multi-line 2 unit is not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

2.1.3 Safety issues

Installing and operating the Multi-line 2 unit may imply work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.

Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

2.1.4 Electrostatic discharge awareness

Sufficient care must be taken to protect the terminal against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

2.1.5 Factory settings

The Multi-line 2 unit is delivered from factory with certain factory settings. These are based on average values and are not necessarily the correct settings for matching the engine/generator set in question. Precautions must be taken to check the settings before running the engine/generator set.

3. Description of Modbus

3.1 Terminal description ECU 100 and GCU 100

3.1.1 Terminal description

Modbus is a standard communication protocol in the Multi-line 2 products ECU and GCU.

Term.	Function	
49	DATA - (B)	Modbus RTU, RS485
50	DATA GND	
51	DATA + (A)	

3.2 Hardware settings

These are the RS485 hardware settings:

a. 9600 or 19200 bps
b. 8 data bits
c. None parity
d. 1 stop bit
e. No flow control

4. Data tables

4.1 Configurable area (read only) (function code 04h)

	Columns: - "X" means standard feature. - Empty fields means not available.

4.1.1 Analogue values

Address	Content		ECU 110	GCU 111	GCU 112	GCU 113
0	U_{L1-L2}	Generator voltage L1-L2 [V]		X	X	X
1	U_{L2-L3}	Generator voltage L2-L3 [V]		X	X	X
2	U_{L3-L1}	Generator voltage L3-L1 [V]		X	X	X
3	U_{L1-N}	Generator voltage L1-N [V]		X	X	X
4	U_{L2-N}	Generator voltage L2-N [V]		X	X	X
5	U_{L3-N}	Generator voltage L3-N [V]		X	X	X
6	f_{L1}	Generator f L1 [Hz/100]		X	X	X
7	I_{L1}	Generator current L1 [A]		X	X	X
8	I_{L2}	Generator current L2 [A]		X	X	X
9	I_{L3}	Generator current L3 [A]		X	X	X
10	P_{GEN}	Generator power [kW]		X	X	X
11	Q_{GEN}	Generator reactive power [kVAr]		X	X	X
12	S_{GEN}	Generator apparent power [kVA]		X	X	X
13	Cos-phi	Generator PF [cosPhi/100]		X	X	X
14	R_{GEN}	Reactive energy counter [kVArh] [Hi]		X	X	X
15	R_{GEN}	Reactive energy counter [kVArh] [Lo]		X	X	X
16	E_{GEN}	Active energy counter [kWh] [Hi]		X	X	X
17	E_{GEN}	Active energy counter [kWh] [Lo]		X	X	X
18	$U_{BBL1-L2}$	U BB L1-L2 [V]			X	X
19	$U_{BBL2-L3}$	U BB L2-L3 [V]			X	X
20	$U_{BBL3-L1}$	U BB L3-L1 [V]			X	X
21	U_{BBL1-N}	U BB L1-N [V]			X	X
22	U_{BBL2-N}	U BB L2-N [V]			X	X
23	U_{BBL3-N}	U BB L3-N [V]			X	X
24	F_{BB}	BB f L1 [Hz/100]			X	X
25		Reserved				
26	$PHI_{BBL1-DGL1}$	U BB L1 - U GEN L1 phase angle [Deg/10]			X	X
27	Alarms	No. of alarms	X	X	X	X
28	Alarms	No. of unack. Alarms	X	X	X	X

Address	Content		ECU 110	GCU 111	GCU 112	GCU 113
29	Start attempts	Start attempts	X	X	X	X
30	Abs. run. hours	Abs. run hours [Hi]	X	X	X	X
31	Abs. run. hours	Abs. run hours [Lo]	X	X	X	X
32	GB_{oper}	No. of GB operations			X	X
33	TB_{oper}	No. of TB operations				X
34	U_{SUPPLY}	DC supply term. 1-2 [V/10]	X	X	X	X
35		Reserved				
36	RPM	RPM	X	X	X	X
37		Multi-input 6 unscaled	X	X	X	X
38		Multi-input 7 unscaled	X	X	X	X
39		Multi-input 8 unscaled	X	X	X	X

4.1.2 Alarms

Address	Bit	Parameter	Content	ECU 100	GCU 111	GCU 112	GCU 113
48			**Generator**				
	0	1000	G -P> 1		X	X	X
	1	1010	G –P> 2		X	X	X
	3	1030	G I> 1		X	X	X
	4	1040	G I> 2		X	X	X
	5		Reserved				
	6		Reserved				
	9	1130	G I>> 1		X	X	X
	10	1140	G I>> 2		X	X	X
	11	1150	G U> 1		X	X	X
	12	1160	G U> 2		X	X	X
	13	1170	G U< 1		X	X	X
	14	1180	G U< 2		X	X	X
	15		Reserved				
49	0	1210	G f> 1		X	X	X
	1	1220	G f> 2		X	X	X
	2		Reserved				
	3	1240	G f< 1		X	X	X
	4	1250	G f< 2		X	X	X
	5		Reserved				
			Busbar				
	6	1270	BB U> 1			X	X
	7	1280	BB U> 2			X	X
	8		Reserved				
	9	1300	BB U< 1			X	X
	10	1310	BB U< 2			X	X
	11		Reserved				
	12		Reserved				
	13	1350	BB f> 1			X	X
	14	1360	BB f> 2			X	X
	15		Reserved				
50	0	1380	BB f< 1			X	X
	1	1390	BB f< 2			X	X
	2		Reserved				
	3		Reserved				

Address	Bit	Parameter	Content	ECU 100	GCU 111	GCU 112	GCU 113
	4		Reserved				
	5		Reserved				
	6		Reserved				
			Generator				
	7	1450	G P> 1		X	X	X
	8	1460	G P> 2		X	X	X
	9		Reserved				
	10		Reserved				
	11		Reserved				
	12		Unbalance curr.		X	X	X
	13		Unbalance volt.		X	X	X
	14	1520	G -Q>		X	X	X
	15	1530	G Q>		X	X	X
54	0	3400	Multi-in. alarm	6	6	6	6
	1	3410	Multi-in. alarm	7	7	7	7
	2	3420	Multi-in. alarm	8	8	8	8
	3	3401	Wire fail.	6	6	6	6
	4	3411	Wire fail.	7	7	7	7
	5	3421	Wire fail.	8	8	8	8
	12	3490	Digital alarm input	20	20	20	20
			(Emer. stop)				
57			**Multi-functional input**				
	0	4120	4-20 mA	6.1	6.1	6.1	6.1
	1	4130	4-20 mA	6.2	6.2	6.2	6.2
	0	4180	RMI oil	6.1	6.1	6.1	6.1
	1	4190	RMI oil	6.2	6.2	6.2	6.2
	0	4200	RMI water	6.1	6.1	6.1	6.1
	1	4210	RMI water	6.2	6.2	6.2	6.2
	0	4220	RMI fuel	6.1	6.1	6.1	6.1
	1	4230	RMI fuel	6.2	6.2	6.2	6.2
	2	4240	W. fail.	6	6	6	6
	3	4250	4-20 mA	7.1	7.1	7.1	7.1
	4	4260	4-20 mA	7.2	7.2	7.2	7.2
	3	4310	RMI oil	7.1	7.1	7.1	7.1
	4	4320	RMI oil	7.2	7.2	7.2	7.2
	3	4330	RMI water	7.1	7.1	7.1	7.1
	4	4340	RMI water	7.2	7.2	7.2	7.2

Address	Bit	Parameter	Content	ECU 100	GCU 111	GCU 112	GCU 113
	3	4350	RMI fuel	7.1	7.1	7.1	7.1
	4	4360	RMI fuel	7.2	7.2	7.2	7.2
	5	4370	W. fail.	7	7	7	7
	6	4380	4-20 mA	8.1	8.1	8.1	8.1
	7	4390	4-20 mA	8.2	8.2	8.2	8.2
	6	4440	RMI oil	8.1	8.1	8.1	8.1
	7	4450	RMI oil	8.2	8.2	8.2	8.2
	6	4460	RMI water	8.1	8.1	8.1	8.1
	7	4470	RMI water	8.2	8.2	8.2	8.2
	6	4480	RMI fuel	8.1	8.1	8.1	8.1
	7	4490	RMI fuel	8.2	8.2	8.2	8.2
	8	4500	Wire failure	8	8	8	8
			Analogue input alarm				
	9	4510	Oversp. 1	X	X	X	X
	10	4520	Oversp. 2	X	X	X	X
	11	4530	Crank failure	X	X	X	X
	12	4540	Running feedback failure	X	X	X	X
	13	4550	MPU wire failure	X	X	X	X
	14	4560	Hz/V failure	X	X	X	X
	15	4570	Start failure	X	X	X	X
			Output				
58	0	5000	Relay	3	3	3	3
	1	5010	Relay	21	21	21	21
	2	5020	Relay	22	22	22	22
	3	5030	Relay	23	23	23	23
	4	5040	Relay	24	24	24	24
	5	5050	Relay	26	26	26	26
	6	5060	Relay	45	45	45	45
	7	5070	Relay	47	47	47	47
59			**General**				
	1		Manual/Local mode	X	X	X	X
	3		Auto/Remote mode	X	X	X	X
	4		Test	X	X	X	X
60			**EIC alarm**				
	0	7570	Communication error	X	X	X	X
	1	7580	Warning	X	X	X	X
	2	7590	Shutdown	X	X	X	X

Address	Bit	Parameter	Content	ECU 100	GCU 111	GCU 112	GCU 113
	3	7600	Overspeed	X	X	X	X
	4	7610	Cool water temp. high 1	X	X	X	X
	5	7620	Cool water temp. high 2	X	X	X	X
	6	7630	Oil pressure low 1	X	X	X	X
	7	7640	Oil pressure low 2	X	X	X	X
	8	7650	Oil temp. 1	X	X	X	X
	9	7660	Oil temp. 2	X	X	X	X
	10	7670	Coolant level 1	X	X	X	X
	11	7680	Coolant level 2	X	X	X	X

***Multi-input – unscaled values**
A short description of the unscaled values and how to interpret these according to the input type selected is made in this document.

The unscaled values have a full range of 0 to 1023 bit.

4-20 mA
0 mA: 0 bit
4 mA: 170 bit
20 mA: 853 bit
25 mA: 1023 bit

Linearity between the unscaled value and the scaled value yields.

0-40V DC
0V DC: 0 bit
40V DC: 925 bit

Linearity between the unscaled value and the scaled value yields.

Pt100
Linearity between the unscaled value and the input resistance yields according to the following equation:

Ω = (x + 509) * 100/771

x: Unscaled value.
Ω: PT resistance value.

Pt1000
Linearity between the unscaled value and the input resistance yields according to the following equation:

Ω = (x + 519) * 10/79

x: Unscaled value.
Ω: PT resistance value.

RMI
Linearity between the unscaled value and the input resistance yields according to the following equations:

If maximum resistance on the sensor is less than or equal to 90.0Ω:

Ω = ((x * 1000) + 300)/10330

x: Unscaled value.
Ω: RMI resistance value.

If maximum resistance on the sensor is above 90.0Ω and less than or equal to 190.0Ω:

Ω = ((x * 1000) - 800)/5160

x: Unscaled value.
Ω: RMI resistance value.

If maximum resistance on the sensor is above 190.0Ω and less than or equal to 490.0Ω:

Ω = ((x * 1000) + 1000)/2070

x: Unscaled value.
Ω: RMI resistance value.

If maximum resistance on the sensor is above 490.0Ω:

Ω = ((x * 1000) + 294)/520

x: Unscaled value.
Ω: RMI resistance value.

Binary
Input high: < 50 bit
Input low: ≥ 50 bit
Cable failure: > 950 bit

It is recommended to use the scaled values for Pt100/1000 and RMI readings.

4.2 Measurement table (read only) (function code 04h)

Address	Content		ECU 100	GCU 111	GCU 112	GCU 113
501	U_{L1-L2}	Generator voltage L1-L2 [V]		X	X	X
502	U_{L2-L3}	Generator voltage L2-L3 [V]		X	X	X
503	U_{L3-L1}	Generator voltage L3-L1 [V]		X	X	X
504	U_{L1-N}	Generator voltage L1-N [V]		X	X	X
505	U_{L2-N}	Generator voltage L2-N [V]		X	X	X
506	U_{L3-N}	Generator voltage L3-N [V]		X	X	X
507	f_{L1}	Generator f L1 [Hz/100]		X	X	X
508	f_{L2}	Generator f L2 [Hz/100]		X	X	X
509	f_{L3}	Generator f L3 [Hz/100]		X	X	X
510	Phi	U gen. phase angle L1-L2 [Deg/10]		X	X	X
513	I_{L1}	Generator current L1 [A]		X	X	X
514	I_{L2}	Generator current L2 [A]		X	X	X
515	I_{L3}	Generator current L3 [A]		X	X	X
516	$P_{GEN\ L1}$	Generator power L1 [kW]		X	X	X
517	$P_{BUSBAR\ L2}$	Busbar power L2 [kW]		X	X	X
518	$P_{GEN\ L3}$	Generator power L3 [kW]		X	X	X
519	P_{GEN}	Generator power [kW]		X	X	X
520	$Q_{GEN\ L1}$	Generator reactive power L1 [kVAr]		X	X	X
521	$Q_{GEN\ L2}$	Generator reactive power L2 [kVAr]		X	X	X
522	$Q_{GEN\ L3}$	Generator reactive power L3 [kVAr]		X	X	X
523	Q_{GEN}	Generator reactive power [kVAr]		X	X	X
524	$S_{GEN\ L1}$	Generator apparent power L1 [kVA]		X	X	X
525	$S_{GEN\ L2}$	Generator apparent power L2 [kVA]		X	X	X
526	$S_{GEN\ L3}$	Generator apparent power L3 [kVA]		X	X	X
527	S_{GEN}	Generator apparent power [kVA]		X	X	X
528	$R_{GEN,\ EXP}$	Export, reactive energy counter [kVArh] [Hi]		X	X	X
529	$R_{GEN,\ EXP}$	Export, reactive energy counter [kVArh] [Lo]		X	X	X
530	$E_{GEN,\ EXP}$	Export, active energy counter, day [kWh] [Hi]		X	X	X
531	$E_{GEN,\ EXP}$	Export, active energy counter, day [kWh] [Lo]		X	X	X

Address	Content		ECU 100	GCU 111	GCU 112	GCU 113
532	$E_{GEN, EXP}$	Export, active energy counter, week [kWh] [Hi]		X	X	X
533	$E_{GEN, EXP}$	Export, active energy counter, week [kWh] [Lo]		X	X	X
534	$E_{GEN, EXP}$	Export, active energy counter, month [kWh] [Hi]		X	X	X
535	$E_{GEN, EXP}$	Export, active energy counter, month [kWh] [Lo]		X	X	X
536	$E_{GEN, EXP}$	Export, active energy counter, total [kWh] [Hi]		X	X	X
537	$E_{GEN, EXP}$	Export, active energy counter, total [kWh] [Lo]		X	X	X
538	Cos-phi	Generator PF [cosPhi/100]		X	X	X
539	$U_{BBL1-L2}$	U BB L1-L2 [V]			X	X
540	$U_{BBL2-L3}$	U BB L2-L3 [V]			X	X
541	$U_{BBL3-L1}$	U BB L3-L1 [V]			X	X
542	U_{BBL1-N}	U BB L1-N [V]			X	X
543	U_{BBL2-N}	U BB L2-N [V]			X	X
544	U_{BBL3-N}	U BB L3-N [V]			X	X
545	F_{BB}	BB FL1 [Hz/100]			X	X
548	$PHI_{BBL1-L2}$	U BB phase angle L1-L2 [Deg/10]			X	X
554	Abs. run. hours	Absolute. run hours [Hi]	X	X	X	X
555	Abs. run. hours	Absolute. run hours [Lo]	X	X	X	X
556	Rel.. run. hours	Relative. run hours [Hi]	X	X	X	X
557	Rel.. run. hours	Relative. run hours [Lo]	X	X	X	X
558	Alarms	No. of alarms	X	X	X	X
559	Alarms	No. of unack. alarms	X	X	X	X
560	Alarms	No. of active acknowledged alarms	X	X	X	X
561	Run. min.	Running min. counter, shutdown override	X	X	X	X
562	Run. hours	Running hour counter, shutdown override	X	X	X	X
563	GB_{oper}	No. of GB operations		X	X	X
564	TB_{oper}	No. of TB operations				X
566	Start attempts	Start attempts	X	X	X	X
567	U_{SUPPLY}	DC supply term. 1-2 [V/10]	X	X	X	X
569	Service	Service timer 1 run. hours	X	X	X	X

Address	Content		ECU 100	GCU 111	GCU 112	GCU 113
570	Service	Service timer 1 run. days	X	X	X	X
571	Service	Service timer 2 run. hours	X	X	X	X
572	Service	Service timer 2 run. days	X	X	X	X
573	Cos-phi	Cos-phi [cosPhi/100]		X	X	X
574	Cos-phi	Cos-phi Inductive/Capacitive 0=Inductive, 1=Capacitive		X	X	X
576	RPM	RPM	X	X	X	X
580		Multi-input 6 unscaled	X	X	X	X
581		Multi-input 7 unscaled	X	X	X	X
582		Multi-input 8 unscaled	X	X	X	X
583		Multi-input 6 scaled	X	X	X	X
584		Multi-input 7 scaled	X	X	X	X
585		Multi-input 8 scaled	X	X	X	X
593-641		See Engine communication manual				
790	$R_{GEN, EXP}$	Export reactive energy counter, month [kWh] [Hi]		X	X	X
791	$R_{GEN, EXP}$	Export reactive energy counter, month [kWh] [Lo]		X	X	X
792	$R_{GEN, EXP}$	Export reactive energy counter, week [kWh] [Hi]		X	X	X
793	$R_{GEN, EXP}$	Export reactive energy counter, week [kWh] [Lo]		X	X	X
794	$R_{GEN, EXP}$	Export reactive energy counter, total [kWh] [Hi]		X	X	X
795	$R_{GEN, EXP}$	Export reactive energy counter, total [kWh] [Lo]		X	X	X
804	$R_{GEN, IMP}$	Import reactive energy counter, total [kWh] [Hi]		X	X	X
805	$R_{GEN, IMP}$	Import reactive energy counter, total [kWh] [Lo]		X	X	X
806	$R_{GEN, IMP}$	Import reactive energy counter, month [kWh] [Hi]		X	X	X
807	$R_{GEN, IMP}$	Import reactive energy counter, month [kWh] [Lo]		X	X	X
806	$R_{BUSBAR, IMP}$	Import reactive energy counter, month [kWh] [Hi]		X	X	X
807	$R_{BUSBAR, IMP}$	Import reactive energy counter, month [kWh] [Lo]		X	X	X
806	$R_{BA, IMP}$	Import reactive energy counter, month [kWh] [Hi]		X	X	X

Address	Content		ECU 100	GCU 111	GCU 112	GCU 113
807	$R_{BA, IMP}$	Import reactive energy counter, month [kWh] [Lo]		X	X	X
808	$R_{GEN, IMP}$	Import reactive energy counter, week [kWh] [Hi]		X	X	X
809	$R_{GEN, IMP}$	Import reactive energy counter, week [kWh] [Lo]		X	X	X
808	$R_{BUSBAR, IMP}$	Import reactive energy counter, week [kWh] [Hi]		X	X	X
809	$R_{BUSBAR, IMP}$	Import reactive energy counter, week [kWh] [Lo]		X	X	X
808	$R_{BA, IMP}$	Import reactive energy counter, week [kWh] [Hi]		X	X	X
809	$R_{BA, IMP}$	Import reactive energy counter, week [kWh] [Lo]		X	X	X
810	$R_{GEN, IMP}$	Import reactive energy counter, day [kWh] [Hi]		X	X	X
811	$R_{GEN, IMP}$	Import reactive energy counter, day [kWh] [Lo]		X	X	X
810	$R_{BUSBAR, IMP}$	Import reactive energy counter, day [kWh] [Hi]		X	X	X
811	$R_{BUSBAR, IMP}$	Import reactive energy counter, day [kWh] [Lo]		X	X	X
810	$R_{BA, IMP}$	Import reactive energy counter, day [kWh] [Hi]		X	X	X
811	$R_{BA, IMP}$	Import reactive energy counter, day [kWh] [Lo]		X	X	X
812	Counter	Pulse counter 01 [Hi]		X	X	X
813	Counter	Pulse counter 01 [Lo]		X	X	X
814	Counter	Pulse counter 02 [Hi]		X	X	X
815	Counter	Pulse counter 02 [Lo]		X	X	X

4.3 Alarm and status table (read only) (function code 04h)

Address	Bit	Channel	Content	ECU 100	GCU 111	GCU 112	GCU 113
			Generator				
1000	0	1000	G -P> 1		X	X	X
	1	1010	G -P> 2		X	X	X
	3	1030	G I> 1		X	X	X
	4	1040	G I> 2		X	X	X
	5		Reserved				
	6		Reserved				
	7		Reserved				
	8		Reserved				
	9	1130	G I>> 1		X	X	X
	10	1140	G I>> 2		X	X	X
	11	1150	G U> 1		X	X	X
	12	1160	G U> 2		X	X	X
	13	1170	G U< 1		X	X	X
	14	1180	G U< 2		X	X	X
	15		Reserved				
1001							
	0	1210	G f> 1		X	X	X
	1	1220	G f> 2		X	X	X
	2	1240	G f< 1		X	X	X
	3	1250	G f< 2		X	X	X
	4		Reserved				
			BB				
	6	1270	BB U> 1			X	X
	7	1280	BB U> 2			X	X
	8		Reserved				
	9	1300	BB U< 1			X	X
	10	1310	BB U< 2			X	X
	11		Reserved				
	12		Reserved				
	13	1350	BB f> 1			X	X
	14	1360	BB f> 2			X	X
	15		Reserved				
1002	0	1380	BB f< 1			X	X
	1	1390	BB f< 2			X	X

Address	Bit	Channel	Content	ECU 100	GCU 111	GCU 112	GCU 113
	2		Reserved				
	3		Reserved				
			Generator				
	7	1450	G P> 1		X	X	X
	8	1460	G P> 2		X	X	X
	9		Reserved				
	10		Reserved				
	11		Reserved				
	12	1500	Unbalance curr.		X	X	X
	13	1510	Unbalance volt.		X	X	X
	14	1520	G -Q>		X	X	X
	15	1530	G Q>		X	X	X
1003			**Generator**				
			Reserved				
			Reserved				
			Busbar				
1004							
	8	1980	GB ext. trip			X	X
	9	1980	TB ext. trip				X
1007			**Digital alarms**				
	0	3000	Digital alarm input	10	10	10	10
	1	3010	Digital alarm input	11	11	11	11
	2	3020	Digital alarm input	12	12	12	12
	3	3030	Digital alarm input	13	13	13	13
	4	3040	Digital alarm input	14	14	14	14
	5	3050	Digital alarm input	15	15	15	15
1013			**Multi-functional input**				
	0	4120	4-20 mA	6.1	6.1	6.1	6.1
	1	4130	4-20 mA	6.2	6.2	6.2	6.2
	0	4180	VDO/RMI oil	6.1	6.1	6.1	6.1
	1	4190	VDO/RMI oil	6.2	6.2	6.2	6.2
	0	4200	VDO/RMI water	6.1	6.1	6.1	6.1
	1	4210	VDO/RMI water	6.2	6.2	6.2	6.2
	0	4220	VDO/RMI fuel	6.1	6.1	6.1	6.1
	1	4230	VDO/RMI fuel	6.2	6.2	6.2	6.2
	2	4240	W. fail.	6	6	6	6
	3	4250	4-20 mA	7.1	7.1	7.1	7.1

Address	Bit	Channel	Content	ECU 100	GCU 111	GCU 112	GCU 113
	4	4260	4-20 mA	7.2	7.2	7.2	7.2
	3	4310	VDO/RMI oil	7.1	7.1	7.1	7.1
	4	4320	VDO/RMI oil	7.2	7.2	7.2	7.2
	3	4330	VDO/RMI water	7.1	7.1	7.1	7.1
	4	4340	VDO/RMI water	7.2	7.2	7.2	7.2
	3	4350	VDO/RMI fuel	7.1	7.1	7.1	7.1
	4	4360	VDO/RMI fuel	7.2	7.2	7.2	7.2
	5	4370	W. fail.	7	7	7	7
	6	4380	4-20 mA	8.1	8.1	8.1	8.1
	7	4390	4-20 mA	8.2	8.2	8.2	8.2
	6	4440	VDO/RMI oil	8.1	8.1	8.1	8.1
	7	4450	VDO/RMI oil	8.2	8.2	8.2	8.2
	6	4460	VDO/RMI water	8.1	8.1	8.1	8.1
	7	4470	VDO/RMI water	8.2	8.2	8.2	8.2
	6	4480	VDO/RMI fuel	8.1	8.1	8.1	8.1
	7	4490	VDO/RMI fuel	8.2	8.2	8.2	8.2
	8	4500	W. fail.	8	8	8	8
			Analogue input alarm				
	9	4510	Overspeed 1	X	X	X	X
	10	4520	Overspeed 2	X	X	X	X
	11	4530	Crank failure	X	X	X	X
	12	4540	Running feedback failure	X	X	X	X
	13	4550	MPU wire failure	X	X	X	X
	14	4560	Hz/V failure	X	X	X	X
	15	4570	Start failure	X	X	X	X
1014	0		Reserved				
	1	4960	U< aux. term.	X	X	X	X
	2	4970	U> aux. term.	X	X	X	X
	5	4590	Underspeed 1	X	X	X	X
1015	0	6110	Service timer 1	X	X	X	X
	1	6120	Service timer 2	X	X	X	X
	2	6270	Stop coil wire break	X	X	X	X
	4	6330	Engine heater 1	X	X	X	X
	12	6540	Unit not in auto/Remote	X	X	X	X
	13	6550	Fuel pump logic	X	X	X	X
1016	0	5000	Terminal 3	X	X	X	X
	1	5010	Terminal 21	X	X	X	X

Address	Bit	Channel	Content	ECU 100	GCU 111	GCU 112	GCU 113
	2	5020	Terminal 22	X		X	X
	3	5030	Terminal 23	X	X	X	X
	4	5040	Terminal 24	X	X	X	X
	5	5050	Terminal 26	X	X	X	X
	6	5060	Terminal 45	X	X	X	X
	7	5070	Terminal 47	X	X	X	X
1017							
	12		Run. coil relay	X	X	X	X
	13		Start prepare	X	X	X	X
	14		Start relay	X	X	X	X
	15		Stop coil relay	X	X	X	X
1018			**Status**				
	0		Main busbar failure				X
	1		TB pos. ON				X
	4		GB pos. ON			X	X
	6		Engine running	X	X	X	X
	7		Running detect. timer expired	X	X	X	X
	8	4560	DG Hz/V OK, timer expired	X	X	X	X
	9	6410	Battery test	X	X	X	X
	11		GB position OFF			X	X
	12		TB position OFF				X
	13		BB Hz/V OK			X	X
1019			**General/Modes**				
	1		Manua/Local mode	X	X	X	X
	3		Auto/Remote mode	X	X	X	X
	4		Test	X	X	X	X
1020-1024			See engine communication manual				

Address	Bit	Channel	Function	ECU 100	GCU 111	GCU 112	GCU 113
1051	0		Virtual event 1	X	X	X	X
	1		Virtual event 2	X	X	X	X
	2		Virtual event 3	X	X	X	X
	3		Virtual event 4	X	X	X	X
	4		Virtual event 5	X	X	X	X
	5		Virtual event 6	X	X	X	X
	6		Virtual event 7	X	X	X	X
	7		Virtual event 8	X	X	X	X
	8		Virtual event 9	X	X	X	X
	9		Virtual event 10	X	X	X	X
	10		Virtual event 11	X	X	X	X
	11		Virtual event 12	X	X	X	X
	12		Virtual event 13	X	X	X	X
	13		Virtual event 14	X	X	X	X
	14		Virtual event 15	X	X	X	X
	15		Virtual event 16	X	X	X	X
1052	0		Virtual event 17	X	X	X	X
	1		Virtual event 18	X	X	X	X
	2		Virtual event 19	X	X	X	X
	3		Virtual event 20	X	X	X	X
	4		Virtual event 21	X	X	X	X
	5		Virtual event 22	X	X	X	X
	6		Virtual event 23	X	X	X	X
	7		Virtual event 24	X	X	X	X
	8		Virtual event 25	X	X	X	X
	9		Virtual event 26	X	X	X	X
	10		Virtual event 27	X	X	X	X
	11		Virtual event 28	X	X	X	X
	12		Virtual event 29	X	X	X	X
	13		Virtual event 30	X	X	X	X
	14		Virtual event 31	X	X	X	X
	15		Virtual event 32	X	X	X	X
1053	0						
	4	1710	G unbalance I 2		X	X	X
	5	7480	Avg U BB > 1			X	X
	6	7490	Avg U BB > 2			X	X
1055	0		LED 1 Red colour	X	X	X	X

Address	Bit	Channel	Function	ECU 100	GCU 111	GCU 112	GCU 113
	1		LED 1 yellow colour	X	X	X	X
	2		LED 1 Green colour	X	X	X	X
	3		LED 1 Flash	X	X	X	X
	4		LED 2 Red colour	X	X	X	X
	5		LED 2 yellow colour	X	X	X	X
	6		LED 2 Green colour	X	X	X	X
	7		LED 2 Flash	X	X	X	X
	8		LED 3 Red colour	X	X	X	X
	9		LED 3 yellow colour	X	X	X	X
	10		LED 3 Green colour	X	X	X	X
	11		LED 3 Flash	X	X	X	X
	12		LED 4 Red colour	X	X	X	X
	13		LED 4 yellow colour	X	X	X	X
	14		LED 4 Green colour	X	X	X	X
	15		LED 4 Flash	X	X	X	X
1057	0		Block start + breaker on			X	X
	1		Only txt alarm			X	X
	2		Open GB/TB/BTB			X	X
	3		Open GB + stop with cooling down			X	X
	4		Open GB + stop without cooling down			X	X
	5		Open TB				X
	6		Safety stop		X	X	X
	7		If MB present "Trip MB" else "Trip GB"				X

4.4 Control register table read (03h)/write(10h)

Control commands must only be used to send a command. They cannot be used to monitor bit status.

Address	Content	Description		ECU 100	GCU 111	GCU 112	GCU 113
5	Control command	Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored.	X	X	X	X
		Bit 1	Remote start	X	X	X	X
		Bit 2	Remote GB ON			X	X
		Bit 3	Remote GB OFF			X	X
		Bit 4	Remote stop	X	X	X	X
		Bit 5	Reserved				
		Bit 6	Reserved				
		Bit 7	Alarm inhibit 1	X	X	X	X
		Bit 8	Alarm inhibit 2	X	X	X	X
		Bit 9	Alarm inhibit 3	X	X	X	X
		Bit 10	Alarm ack. This bit is automatically reset	X	X	X	X
		Bit 11	Nominal setting 1	X	X	X	X
		Bit 12	Nominal setting 2	X	X	X	X
		Bit 13	Reserved				
		Bit 14	Reserved				
		Bit 15	Reserved				
6	Control command	Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored.				X
		Bit 1	Reserved				
		Bit 2	Reserved				
		Bit 3	Reserved				
		Bit 4	Reserved				
		Bit 5	Reserved				
		Bit 6	Reserved				
		Bit 7	Reserved				
		Bit 8	Reserved				

Address	Content	Description		ECU 100	GCU 111	GCU 112	GCU 113
		Bit 9	Remote TB ON			X	X
		Bit 10	Remote TB OFF			X	X
		Bit 11	Reserved				
		Bit 12	Manual/local mode	X	X	X	X
		Bit 13	Auto/remote mode	X	X	X	X
		Bit 14	Reserved				
		Bit 15	Test mode	X	X	X	X
7		Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored.	X	X	X	X
		Bit 1	Reserved				
		Bit 2	Reserved				
		Bit 3	Reserved				
		Bit 4	Reserved				
		Bit 5	Reserved				
		Bit 6	Reserved				
		Bit 7	Reserved				
		Bit 8	Reserved				
		Bit 9	Reserved				
		Bit 10	Reserved				
		Bit 11	Reserved				
		Bit 12	Reserved				
		Bit 13	Battery test				X
		Bit 14	Reserved				
		Bit 15	Synchronise clock to 4:00 AM				X
8		Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored				X
		Bit 1	Virtual 1	X	X	X	X
		Bit 2	Virtual 2	X	X	X	X
		Bit 3	Virtual 3	X	X	X	X
		Bit 4	Virtual 4	X	X	X	X
		Bit 5	Virtual 5	X	X	X	X
		Bit 6	Virtual 6	X	X	X	X

Address	Content	Description		ECU 100	GCU 111	GCU 112	GCU 113
		Bit 7	Virtual 7	X	X	X	X
		Bit 8	Virtual 8	X	X	X	X
		Bit 9	Virtual 9	X	X	X	X
		Bit 10	Virtual 10	X	X	X	X
		Bit 11	Virtual 11	X	X	X	X
		Bit 12	Virtual 12	X	X	X	X
		Bit 13	Virtual 13	X	X	X	X
		Bit 14	Virtual 14	X	X	X	X
		Bit 15	Virtual 15	X	X	X	X
9		Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored.	X	X	X	X
		Bit 1	Virtual 16	X	X	X	X
		Bit 2	Virtual 17	X	X	X	X
		Bit 3	Virtual 18	X	X	X	X
		Bit 4	Virtual 19	X	X	X	X
		Bit 5	Virtual 20	X	X	X	X
		Bit 6	Virtual 21	X	X	X	X
		Bit 7	Virtual 22	X	X	X	X
		Bit 8	Virtual 23	X	X	X	X
		Bit 9	Virtual 24	X	X	X	X
		Bit 10	Virtual 25	X	X	X	X
		Bit 11	Virtual 26	X	X	X	X
		Bit 12	Virtual 27	X	X	X	X
		Bit 13	Virtual 28	X	X	X	X
		Bit 14	Virtual 29	X	X	X	X
		Bit 15	Virtual 30	X	X	X	X
10		Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored.	X	X	X	X
		Bit 1	Virtual 31	X	X	X	X
		Bit 2	Virtual 32	X	X	X	X
		Bit 3	Reserved				
		Bit 4	Clear log	X	X	X	X

Address	Content	Description	ECU 100	GCU 111	GCU 112	GCU 113
58000	Year	2003-2099	X	X	X	X
58001	Month	1-12	x	x	x	x
58002	Date	1-31	x	x	x	x
58003	Day	1…7 (Monday…Sunday)	x	x	x	x
58004	Hour	0-23	x	x	x	x
58005	Min.	0-59	x	x	x	x
58006	Sec.	0-59	x	x	x	x

All control bits are automatically reset by the ML-2 unit.

4.5 Command flags table (write only) (function code 0Fh)

Address	Content	Description	ECU 100	GCU 111	GCU 112	GCU 113
0	Remote start		X	X	X	X
1	Remote GB ON				X	X
	Reserved					
	Reserved					
2	Remote GB OFF				X	X
	Reserved					
	Reserved					
3	Remote stop		X	X	X	X
4	Alarm inhibit 1		X	X	X	X
5	Alarm inhibit 2		X	X	X	X
6	Alarm inhibit 3		X	X	X	X
9	Alarm ack.		X	X	X	X
10	Nominal setting 1		X	X	X	X
11	Nominal setting 2		X	X	X	X
17	Reserved					
	Reserved					
24	Remote TB ON					X
25	Remote TB OFF					X
27	Manual/Local mode		X	X	X	X
29	Auto/Remote mode		X	X	X	X
30	Test mode		X	X	X	X
48	Virtual event 1		X	X	X	X
49	Virtual event 2		X	X	X	X
50	Virtual event 3		X	X	X	X
51	Virtual event 4		X	X	X	X
52	Virtual event 5		X	X	X	X
53	Virtual event 6		X	X	X	X
54	Virtual event 7		X	X	X	X
55	Virtual event 8		X	X	X	X
56	Virtual event 9		X	X	X	X
57	Virtual event 10		X	X	X	X
58	Virtual event 11		X	X	X	X
59	Virtual event 12		X	X	X	X
60	Virtual event 13		X	X	X	X
61	Virtual event 14		X	X	X	X

Address	Content	Description	ECU 100	GCU 111	GCU 112	GCU 113
62	Virtual event 15		X	X	X	X
63	Virtual event 16		X	X	X	X
64	Virtual event 17		X	X	X	X
65	Virtual event 18		X	X	X	X
66	Virtual event 19		X	X	X	X
67	Virtual event 20		X	X	X	X
68	Virtual event 21		X	X	X	X
69	Virtual event 22		X	X	X	X
70	Virtual event 23		X	X	X	X
71	Virtual event 24		X	X	X	X
72	Virtual event 25		X	X	X	X
73	Virtual event 26		X	X	X	X
74	Virtual event 27		X	X	X	X
75	Virtual event 28		X	X	X	X
76	Virtual event 29		X	X	X	X
77	Virtual event 30		X	X	X	X
78	Virtual event 31		X	X	X	X
79	Virtual event 32		X	X	X	X

All flags are automatically reset by the ML-2 unit.

4.6 Status flags table (read only) (function code 02h)

Address	Content	ECU 100	GCU 111	GCU 112	GCU 113
0	GB position ON			X	X
1	EDG-TB position ON				X
2	Reserved				
3	Running	X	X	X	X
4	Generator voltage/frequency OK		X	X	X
5	Main busbar failure				X
6	Reserved				
7	Manual/Local mode	X	X	X	X
9	Auto/Remote mode	X	X	X	X
10	Test mode	X	X	X	X
29	Battery test	X	X	X	X

4.7 Digital input table (read only 02h)

Addr.	Description	ECU	GCU 111	GCU 112	GCU 113
22500	Digital input	10	10	10	10
22501	Digital input	11	11	11	11
22502	Digital input	12	12	12	12
22503	Digital input	13	13	13	13
22504	Digital input	14	14	14	14
22505	Digital input	15	15	15	15
22516	Emergency stop	20	20	20	20

4.8 Digital output table (read only 02h)

Addr	Description	ECU	GCU 111	GCU 112	GCU 113
23001	Relay 3	X	X	X	X
23002	Relay 21	X	X	X	X
23003	Relay 22	X	X	X	X
23004	Relay 23	X	X	X	X
23005	Relay 24	X	X	X	X
23006	Relay 26	X	X	X	X
23007	Relay 45	X	X	X	X
23008	Relay 47	X	X	X	X

5. Parameter setting

5.1 Parameter reading and writing

The entire setting of parameters can be made using the Modbus. The combination of function and address areas used is described below:

5.1.1 Function 01(01hex) read/write flag status

Reads the ON/OFF status of discrete flags in the slave unit.

Address area for reading of status flags:

Data to request	Table	Address area
Enable	Parameter table	2000-3999

The maximum number of data query is limited by the length of the actual table.

5.1.2 Function 02(02hex) read flag status

Reads the ON/OFF status of discrete flags in the slave unit.

Address area for reading of status flags:

Data to request	Table	Address area
Alarm active	Parameter table	4000-5999
Alarm acknowledge	Parameter table	6000-7999
Timer output	Parameter table	8000-9999
Timer running	Parameter table	10000-11999

The maximum number of data query is limited by the length of the actual table.

5.1.3 Function 03(03hex) read registers

Reads the binary of registers in the slave unit.

Address area for reading of registers:

Data to request	Table	Address area
Timers used	Parameter table	2000-3999
Values used	Parameter table	4000-5999
Values minimum	Parameter table	6000-7999
Values maximum	Parameter table	8000-9999
Output a	Parameter table	10000-11999
Output b	Parameter table	12000-13999
Fail class used	Parameter table	14000-15999
Enable	Parameter table	16000-17999
Inhibit	Parameter table	18000-19999

The maximum number of data query is limited by the length of the actual table.

5.1.4 Function 04(04hex) read registers

Reads the binary of registers in the slave unit.

Address area for reading of registers:

Data to request	Table	Address area
Timers minimum	Parameter table	2000-3999
Timers maximum	Parameter table	4000-5999
Output a minimum	Parameter table	6000-7999
Output a maximum	Parameter table	8000-9999
Output b minimum	Parameter table	10000-11999
Output b maximum	Parameter table	12000-13999
Fail class minimum	Parameter table	14000-15999
Fail class maximum	Parameter table	16000-17999
Timers elapsed time	Parameter table	20000-21999

The maximum number of data query is limited by the length of the actual table.

5.1.5 Function 15(0Fhex) write multiple flags, function 5(05hex) write single flag

Writes each flag (0 x reference) in a sequence of flags to either ON or OFF.

Address area for writing of status flags:

Data to request	Table	Address area
Enable	Parameter table	2000-3999
Ack. alarm	Parameter table	6000-7999

5.1.6 Function 16(10hex) write register, function 6(06hex) write single register

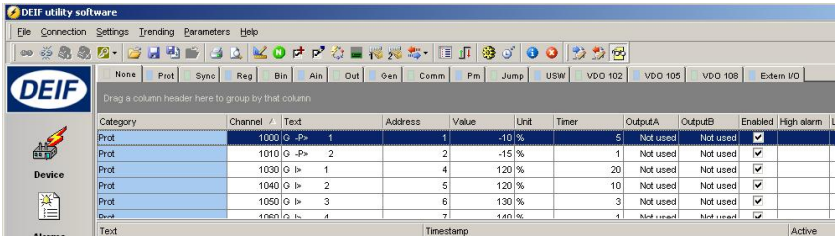
Writes values into a sequence of registers.

Address area for writing of registers:

Data to request	Table	Address area
Timers used	Parameter table	2000-3999
Values used	Parameter table	4000-4999
Output a	Parameter table	10000-11999
Output b	Parameter table	12000-13999
Fail class used	Parameter table	14000-15999
Enable	Parameter table	16000-17999
Inhibit	Parameter table	18000-19999

5.1.7 Parameter addresses

Channel and Modbus address numbers can be found in the utility software parameter list for the unit in question.



Limitations

It is possible to write to channels where the option is not activated. It is not possible to enable the channel. E.g. if an attempt is made to write a ”1” to the enable flag, then the ”1” will be discarded, and the enable flag remains ”0”. It is not possible to write to offset address 0. These values are used for DEIF internal version control.

5.1.8 Examples

Write nominal frequency (6011), offset 258, 60Hz
ID = 1, 60Hz = 600Hz/10 = 0258h
Address 4000 + 258 = 4258d = 10A2h
Tx: 01h 10h 10h A2h 00h 01h 02h 02h 58h AEh 49h
Rx: 01h 10h 10h A2h 00h 01h A4h EBh

Read nominal frequency (6011) offset 258, 60Hz
Tx: 01h 03h 10h A2h 00h 01h 21h 28h
Rx: 01h 03h 02h 02h 58h B8h DEh
Read 0258h = 600d