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MOTOR PROTECTION & CONTROL TECHNOLOGY

KE-Relay or KD-Relay Profibus DPV0 Communication Module

User Manual

KE-PROFI-DP0
Version 01.04
(NE_NC-KE-PROFI-DP0_MAN_01_10_FN04)

28 June 2010

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Content

1. ABSTRACT

The KE-PROFI-DP0 (KE or KD-Relay Profibus DPV0) acts as a translator between the Profibus SCADA and the KE or KD-Relay. It is advisable to read the KE or KD user manual, as some of the topics will require knowledge on the KE or KD. It is also advisable to have knowledge on profibus. Information on profibus can be found at the web site www.profibus.com.

The communication protocol between the KE-PROFI-DP0 and SCADA is Profibus DPV0 class 1. Communication protocol between the KE-PROFI-DP1 and the KE or KD Relay is a NewElec proprietary protocol. Enabling the PLC to communicate with the KE or KD-Relay via Profibus DPV0.

2. SPECIFICATIONS

2.1 Technical Specifications of KE-PROFI-DP0

General Data	Mounting Positions	● External module.
	Allowed Ambient Temperature	● Operation : 0 ºC to +60 ºC
	Humidity	● < 87%
NC-MK1-PROFI-DP0	Power Supply	● 220 Vac ● 110 Vac
	Consumption	● 180 mA
	Communication Mediums	● Profibus ● RS232
Profibus	Protocol	● Profibus DPV0
	Baud Rate	● 9600 bit/s to 12 Mbit/s
	Cable Length @ Baud Rate	● 1200 m @ 9600 bit/s to 45450 bit/s ● 1000 m @93.75Kbit/s to 187.5Kbit/s ● 400 m @ 500 Kbit/s ● 200 m @ 1.5 Mbit/s ● 100 m @ 3 Mbit/s to 12 Mbit/s
	Termination Resistor (Termination resistors must be connected at the beginning and end of bus)	● 220 Ohm.
Indication Lights	Type	● Light Emitting Diode (LED)
	LED Indications	● SCADA Communication ● KE or KD Communication

2.2 Structure Of The Parametrization Telegram

The parametrization telegram data will look as follow:

Byte Addr	Parameter Name	Description	Range
1	Profibus Config A	Configuration byte of the KE-PROFI-DP0: • Bit 0 = Parametrize Settings. • Bit 1 = Parametrize Logic Function. • Bit 2 ~ 6 = Reserved. • Bit 7 = Fail Safe Disabled.	Set
2	Din	Amount of words from the Relay to the SCADA.	1 ~ 5
3 ~ 7	Word 1 ~ 5 To SCADA	Pointer to KE-Relay Pointer Table (2.2.1).	0 ~ 12
8	Unbalance Trip Level	Trip level for unbalance in %.	0 ~ 100
9	Unbalance Trip Delay	Unbalance trip delay in seconds.	0~99
10	Voltage selection	Select the line voltage of the relay. • 0 = Auto. • 1 = 110 Vac. • 2 = 400 Vac. • 3 = 525 Vac. • 4 = 1050 Vac.	0 ~ 4
11	Volt. Sym. Trip Level	Voltage symmetric trip level in %.	0 ~ 100
12	Starts Per Hour	Amount of starts that can be taken in a hour.	1 ~ 30
13	Consecutive Starts	Amount of starts to be take after a failed start attempt.	1 ~ 3
14 ~ 15	Earth Leak Trip Level	Earth leakage trip level in mA.	0 ~ 999
16 ~ 17	Earth Leak Trip Delay	Delayed time for earth leakage in ms with 50 ms incremental.	100 ~ 1000
18	Earth Leakage Trip Type	Type of earth leakage trip. • 0 = Instantaneous. • 1 = IDMT.	0 ~ 1
19	Max. Load Setting	Maximum load setting of the relay in %.	10 ~ 100
20	TC Curve	Thermal capacity curve selected in %.	3 ~ 40
21	TC Reset Threshold	Thermal capacity reset level in %.	1 ~ 10
22	ML Reset Timer	Time to reset the relay after minimum load trip. • 0 = Manual. • 1 = 10 Seconds. • 2 = 5 Minutes. • 3 = 10 Minutes. • 4 = 20 Minutes.	0 ~ 9

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		• 5 = 30 Minutes. • 6 = 45 Minutes. • 7 = 1 Hour. • 8 = 3 Hours. • 9 = 6 Hours.	
23	ML Current Trip Level	Minimum load trip level in %.	0 ~ 100
24	ML Power Trip Level	Minimum load power trip level %.	0 ~ 100
25	ML Startup Trip Delay	Time to delay minimum load trip at start up in seconds.	1 ~ 200
26	ML Trip Delay	Delay run time trip delay in seconds.	0 ~ 10
27 ~ 28	Running Stall Level	Running stall trip level in %.	110 ~ 300
29 ~ 30	Run. Stall Hold Time	Running stall hold off time in seconds.	0 ~ 200
31	Control Byte A	Control byte A: • Bit 0 = Minimum load disabled. • Bit 1 = Under voltage disabled. • Bit 2 = Over voltage disabled. • Bit 3 = Voltage Symmetric disabled. • Bit 4 = Fail safe disabled. • Bit 5 = Unbalance disabled. • Bit 6 = Phase rotation disabled. • Bit 7 = Short circuit disabled.	
32	Control Byte B	Control byte B: • Bit 0 = Single phase disabled. • Bit 1 = Running stall disabled. • Bit 2 = ML = power factor selected. • Bit 3 = Earth leakage disabled. • Bit 4 = Low pass filter disabled. • Bit 5 = Insulation lockout disabled. • Bit 6 = Frequency disabled. • Bit 7 = Auto calc. TC reset disabled.	
33	Control Byte C	Control Byte C: • Bit 0 = Starts per hour disabled. • Bit 1 = Phase rotation reversed. • Bit 2 = Vectorial stall disabled. • Bit 3 = Auto reset. • Bit 4 ~ 7 = Reserved.	
34	Logic Function 1 Mask	Logic function 1 mask register.	0 ~ 255
35	LF 1 A Input pointer	Input Pointers 1 (2.2.2).	0 ~ 50
36	LF 1 B Input pointer	Input Pointers 1 (2.2.2).	0 ~ 50
37	LF 1 C Input pointer	Input Pointers 1 (2.2.2).	0 ~ 50

38	Logic Function 2 Mask	Logic function 2 mask register.	0 ~ 255
39	LF 2 A Input pointer	Input Pointers 1 (2.2.2).	0 ~ 50
40	LF 2 B Input pointer	Input Pointers 1 (2.2.2).	0 ~ 50
41	LF 2 C Input pointer	Input Pointers 1 (2.2.2).	0 ~ 50
42	Logic Function 3 Mask	Logic function 3 mask register.	0 ~ 255
43	LF 3 A Input pointer	Input Pointers 1 (2.2.2).	0 ~ 50
44	LF 3 B Input pointer	Input Pointers 1 (2.2.2).	0 ~ 50
45	LF 3 C Input pointer	Input Pointers 1 (2.2.2).	0 ~ 50
46 ~ 47	Timer A Time Out	Time for timer A to time out in seconds.	0 ~ 3000
48	Timer A Start Input Ptr	Input Pointers 1 (2.2.2).	0 ~ 50
49	Timer A Stop Input Ptr	Input Pointers 1 (2.2.2).	0 ~ 50
50 ~ 51	Timer B Time Out	Time for timer B to time out in seconds.	0 ~ 3000
52	Timer B Start Input Ptr	Input Pointers 1 (2.2.2).	0 ~ 50
53	Timer B Stop Input Ptr	Input Pointers 1 (2.2.2).	0 ~ 50
54	RTC Start Hour	Real time clock start hours.	0 ~ 23
55	RTC Start Minutes	Real time clock start minutes.	0 ~ 59
56	RTC Stop Hour	Real time clock stop hours.	0 ~ 23
57	RTC Stop Minutes	Real time clock stop minutes.	0 ~ 59
58	Relay 2 Input Ptr	Input Pointers 1 (2.2.2).	0 ~ 50

2.2.1 KE-Relay Pointer Table

Values that can be routed to for the PLC words in 1 to 5.

Address	Name
0	TC remaining
1	Current Level.
2	Red Phase Voltage Level.
3	White Phase Voltage Level.
4	Blue Phase Voltage Level.
5	Actual Power
6	Alarm Flags • Bit 0 = In Service. • Bit 1 = Earth Leakage. • Bit 2 = Over Current. • Bit 3 = Running Stall. • Bit 4 = Unbalance. • Bit 5 = Single Phase. • Bit 6 = Minimum Load. • Bit 7 = Short Circuit. • Bit 8 = Voltage Present. • Bit 9 = Over Voltage. • Bit 10 = Under Voltage. • Bit 11 = Voltage Symmetric. • Bit 12 = Insulation Lockout. • Bit 13 = Low Frequency. • Bit 14 = High Frequency. • Bit 15 = Earth Fault.
7	Trip Flags • Bit 0 = Over Current. • Bit 1 = Running Stall. • Bit 2 = Unbalance. • Bit 3 = Single Phase. • Bit 4 = Minimum Load. • Bit 5 = Short Circuit. • Bit 6 = Phase Rotation. • Bit 7 = Earth Fault. • Bit 8 = Over Voltage. • Bit 9 = Under Voltage. • Bit 10 = Voltage Symmetric. • Bit 11 = Insulation Lockout..

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	• Bit 12 = Low Frequency. • Bit 13 = High Frequency. • Bit 14 = Earth Fault. • Bit 15 = Starts Per Hour.
8	Voltage Symmetric Level
9	Earth Leakage Level.
10	Frequency
11	Insulation Lockout
12	Function Flags. • Bit 0 = Logic Function 1. • Bit 1 = Logic Function 2. • Bit 2 = Logic Function 3. • Bit 3 = Timer A. • Bit 4 = Timer B. • Bit 5 = Real Time Clock. • Bit 6 = Main Trip Relay. • Bit 7 = Relay 2.
13	Apparent Power Consumption
14	Real Power Consumption

2.2.2 Input Pointers 1

It is signals that can be routed to the inputs of the logic functions, timers and relays.

Address	Name
0	Constant Zero
1	Constant One
2	In Service Flag
3	Voltage Present Flag
4	Over Current Alarm Flag
5	Short Circuit Alarm Flag
6	Running Stall Alarm Flag
7	Unbalance Alarm Flag
8	Single Phase Alarm Flag
9	Earth Fault Alarm Flag
10	Earth Leakage Alarm Flag
11	Minimum Load Alarm Flag
12	Over Voltage Alarm Flag
13	Under Voltage Alarm Flag
14	Voltage Symmetric Alarm Flag
15	High Frequency Alarm Flag
16	Low Frequency Alarm Flag
17	Insulation Lockout Alarm Flag
18	Over Current Trip Flag
19	Short Circuit Trip Flag
20	Running Stall Trip Flag
21	Unbalance Trip Flag
22	Single Phase Trip Flag
23	Earth Fault Trip Flag
24	Earth Leakage Trip Flag
25	Minimum Load Trip Flag
26	Over Voltage Trip Flag
27	Under Voltage Trip Flag
28	Voltage Symmetric Trip Flag
29	High Frequency Trip Flag
30	Low Frequency Trip Flag
31	Insulation Lockout Trip Flag
32	Phase Rotation Trip Flag

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33	Starts Per Hour Trip Flag
34	Timer A Output
35	Inverted Timer A Output
36	Timer B Output
37	Inverted Timer B Output
38	RTC Output
39	Inverted RTC Output
40	Logical Function 1 Output
41	Inverted Logical Function 1 Output
42	Logical Function 2 Output
43	Inverted Logical Function 2 Output
44	Logical Function 3 Output
45	Inverted Logical Function 3 Output
46	Restart Flag
47	Frozen Contact Flag
48	PLC Bit 0
49	PLC Bit 1
50	TC > TC warning level.

2.3 Cyclic Out Byte

The message from the PLC to the slave will look as follow:

Byte :: Bit	Description
0::0	PLC bit 0
0::1	PLC bit 1
0::2 ~ 5	Reserved
0::6	Reset Relay
0::7	Fail safe communication between relay and slave is disabled

2.4 Diagnostics

Diagnostic message will look as follow:

Byte	Description
0 ~ 2	Station status as per DP specifications.
3	Master profibus address.
4 ~ 5	Manufacture ID.
6	Diagnostic Length.
7 ~ 8	Alarm Flags.
9 ~ 10	Trip Flags.
11	Function Flags
12	Profibus Status. • Bit 0 = Communication failure with KE or KD-Relay.
13 ~ 14	Startup Counter.
15 ~ 16	Trip Counter.
17 ~ 18	Running Hour Counter.
19 ~ 20	Apparent Power Consumption.
21 ~ 22	Real Power Consumption.

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3. DEFINITIONS AND TERMINOLOGY

EEPROM	Electrical Erasable Programmable Read Only Memory (non volatile)
Flash memory	Similar to EEPROM (only block write - non volatile)
In service	When the current rise above 10% of full load current it is assumed that the motor is running.
Intrinsic safe	It is a protection technique for safe operation of electronic equipment in explosive atmospheres. The concept was developed for safe operation of process control instrumentation in hazardous areas. The theory behind intrinsic safety is to ensure that the available electrical and thermal energy in the system is always low enough that ignition of the hazardous atmosphere cannot occur.
LED	Light emitting diode (It is used as visual indicators)
Motor protection relay	It is an intelligent (computerized) unit monitoring an electric motor's current and voltage supply. In case of overloading, phase lost etc. the power supply of the motor will be interrupted by the protection relay to prevent damage to the motor.
Dout	Data send from the PLC to the slave device.
Din	Data received by the PLC from a slave device.
KE-PROFI-DP1	KE / KD-Relay Profibus module with DPV0 capability.
PLC	Programmable Logic Controller.

4. FUNCTIONAL DESCRIPTION

The KE-PROFI-DP0 can be broken down into the following function blocks:
- Micro-Controller
- KE / KD-Relay Interface.
- Profibus Interface.
- Light Emitting Diodes (LED)

Micro-Controller – Is the core of the system. The micro-controller ensures that the operation of the KE-PROFI-DP0 gets executed. The micro-controller acts as a bridge between the KE / KD-Relay and the PLC.

KE / KD-Relay Interface – Is the communication bus between the KE / KD-Relay and KE-PROFI-DP0. With the KE / KD-Relay interface it is possible for the two micro-controllers KE / KD-Relay and KE-PROFI-DP0 to exchange data.

Profibus Interface – Allows the KE / KD-Relay to communicate with the PLC. With the profibus interface it is possible to update the KE-PROFI-DP0 with new values as well as the PLC.

Light Emitting Diodes – Allows the KE-PROFI-DP0 to indicate conditions to the operator.

5. OPERATING INSTRUCTIONS

5.1 Getting Started

5.1.1 Setting Up The KE-PROFI-DP0

Following must be done via the KE-PROFI-DP0 front-end:
- Connect the KE-PROFI-DP0 to the front-end via the RS232 port.
- Set the address of the KE-PROFI-DP0.
- Transmit the data to the KE-PROFI-DP0.

5.1.2 Installing Of NC-MK1-PROFI-DP1 GSD File

Following steps must be taken to install the GSD File:
- Import the NewElec NEWEFF881.gsd into the STEP7 GSD directory.
- Insert the KE-PROFI-DP0 device into the hardware configuration of the STEP7 program.
- Set the KE-PROFI-DP0 stations address in the PLC hardware configuration. The address must match the address in the KE-PROFI-DP0.
- Set the parametrization of the KE-PROFI-DP0.
- Make sure that the cyclic Din matches those of the KE-PROFI-DP0 parametrization bytes.
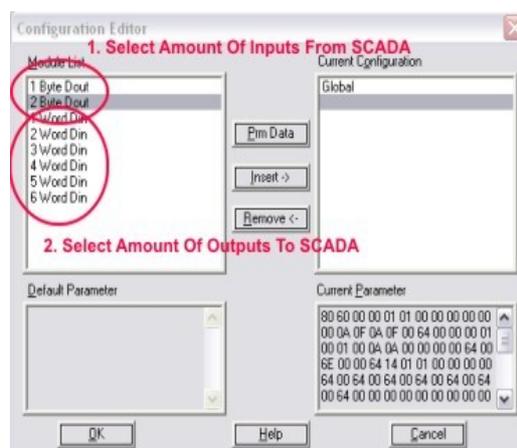
6. DIAGRAMS

6.1 Block Diagram of NC-MK1-PROFI-DP1

```
         ┌─────────────────┐
         │                 │
         │   KE / KD-Relay │
         │    Interface    │
         │                 │
         └────────┬────────┘
                  ↕
         ┌────────┴────────┐
         │                 │
         │ Micro-Controller│
         │   With Memory   │
         │                 │
         └──┬───────────┬──┘
            ↕           ↓
   ┌────────┴───┐   ┌──┴─────────┐
   │            │   │            │
   │  Profibus  │   │    LED     │
   │  Interface │   │            │
   │            │   │            │
   └────────────┘   └────────────┘
```
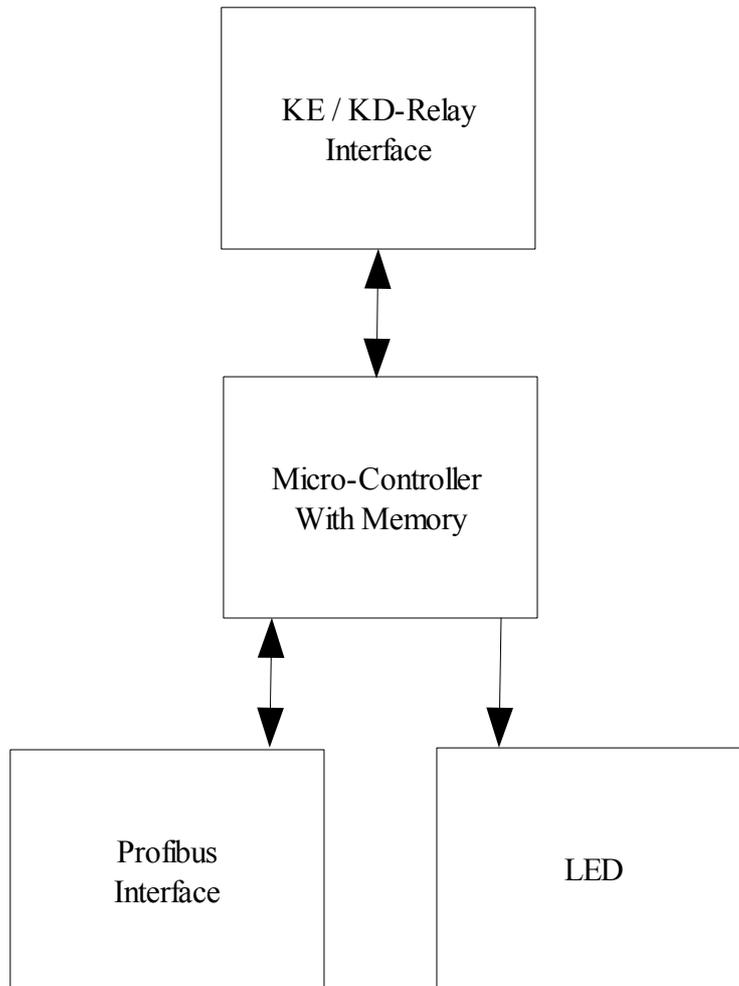
7. PROFIBUS GSD REGISTERED

PROFIBUS Nutzerorganisation e.V.
Haid-und-Neu-Str. 7
D-76131 Karlsruhe
Tel.: +49-721-96 58-590
Fax: +49-721-96 58 589
E-mail: info@profibus.com
http://www.profibus.com

Confirmation

Registration of a PROFIBUS Device

Model name :   **KE-PROFI-DP0**

Release :

Manufacturer :   **NEWELEC PRETORIA (PTY) LTD**

The following details have been registered by PNO for the device mentioned above:

Device type: ☐ Master   ☑ Slave

Protocol type: ☐ FMS   ☑ DP   ☐ DP Extensions

ID Number :   **F881 HEX**

GSD file :   **NEWEF881.GSD**

Contact person:
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Karlsruhe, 2010-04-16
Place, Date

_____
Business office of the PROFIBUS Nutzerorganisation e.V.

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