mecc alte

POWER FROM WITHIN

DIGRIN CONTROLLER

SMARTECH
A DIVISION OF MECC ALTE

USER MANUAL


DIGRIN
CAN BUS
TEMP. 3
TEMP. 2
TEMP. 1
ALARM OUT
REMOTE
ON WORK
J5
ALARM OUTPUT
NO
COM
J6
J7
J8
JP
SW1
THERMO-RESISTOR 3
PT100
THERMO-RESISTOR 2
PT100

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1. GENERAL CHARACTERISTICS

The device lets you connect three independent Pt100 thermo-resistors, galvanically isolated from each other and the power source, so the metal side of the thermo-resistors can make contact with metal surfaces that have a potential other than zero. Thermo-resistors with two or three wire connection can be used.

It is available in two versions, with CANBUS or RS485 MODBUS communication. A further RS232 connection via Jack is available to configure the device. You can set thresholds for alarms/warnings and the activation of relays, with the relevant response times for each temperature input.

1.1 VERSIONS AVAILABLE

E6102094100xx	**DIGRIN CANBUS** (isolated CAN BUS + non-isolated RS232 via jack connector) Designed to be used with DST4601/PX, GC3xx, GC5xx devices with CANBUS connection; up to 16 modules with proprietary protocol Mecc Alte EX-BUS can be connected, or 2 modules for max. 5 thermo-resistors, for reading the temperatures of the alternator bearings and windings with J1939 protocol.
E6102094101xx	**DIGRIN MODBUS RS485** (Isolated RS485 + non-isolated RS232 with jack connector used only for configuration). For use with devices using MODBUS RTU protocol with RS485 connection.

1.2 TECHNICAL SPECIFICATIONS

Thermo-resistor Inputs				
Type	**Temp. Min**	**Temp. Max**	**Resolution**	**Scale end error**
PT100	**-70 °C**	**650 °C**	**0.1 °C**	**2 with 3-wire connection** **Depending on the type and length of the connecting cables with two connection wires**
Number of channels:				**3**
Sampling time:				300 ms

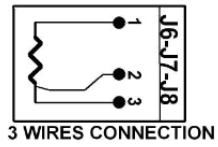
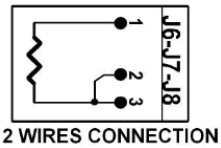
Power input	
Input voltage	7÷32VDC
Current absorbed	100 mA (@ 13V)
Consumption	Max. 2.4 W
Insulation	1000 V

Environmental conditions			
Operating temperature:		from -20°C to +60°C	
Humidity:		from 30 to 90% condensate-free	
Storage temperature:		from -20°C to +70°C	
Degree of protection		IP 20	
Dimensions/Weight			
Dimensions:	101Hx35Lx119D	**Weight:**	165 g

Connections
J1 VDC power supply
J6, **J7**, **J8** thermo-resistor inputs
JP 3.5 mm jack RS232 for parameter configuration.
J2 RS485 or CANBUS connection.
J5 cumulative alarms/prealarms output (NO dry contact relay max. 30VDC @ 500mA)

1.3 TYPE OF THERMO-RESISTORS USED

The device can use sensors with two or three wires. Connect the sensors to terminals J6, J7 and J8 as follows:

 3 WIRES CONNECTION	The use of three-wire sensors can compensate for reading error caused by the resistance of the connection cables. This connection gives you the precision indicated in the specifications.
 2 WIRES CONNECTION	With two-wire sensors, bridge pins 2 and 3 directly on the terminals. The bridge can also be installed on the output terminal of the board; this compensates for the resistance of the cables running from the device to the terminal board.

1.4 INDICATORS

LED	Description
ON WORK	Running LED (flashes to indicate the device is on)
REMOTE	Indicates the state of the main communication interface. For can bus version: LED flashing = no communication (bus off or passive error), LED on = Can communication active (Active error). For RS485 version: LED off = no communication, LED on = communication active.
ALARM OUT	Indicates the state of relay output J5 (led ON = contact closed)
TEMP 1	Signals on thermo-resistor 1 (see table below)
TEMP 2	Signals on thermo-resistor 2 (see table below)
TEMP 3	Signals on thermo-resistor 3 (see table below)

TEMP1, 2, 3 LED flashing	Meaning
Off	No signal
one fast flash	Indicates Delta T function has been activated, so temperature value T3 = T2-T1. Only on LED TEMP3.
two fast flashes	The relay output activation threshold has been reached.
50% alternate blinking	Exceeded high-temperature threshold (Prealarm).
Lit fixed	Exceeded max. temperature threshold (Alarm).

2. MODBUS SPECIFICATIONS

Protocol: **Rtu Modbus**

Two baud rates can be selected with switches: **9600 / 19200**

Transm. parameters: **N, 8, 1** fixed

Modbus address selectable with SWN switch: **1-32** (RS485 version), **1-16** (CANBUS version)

N.B.: register writing is protected (SWN-8=OFF → protection active, cannot write).

Modbus Registers - Input Register		Format
30001	Conv. points 1	16 bit with sign (range from -32768 to +32767)
30002	Conv. points 2	
30003	Conv. points 3	
30015	SWN switch on start-up and current	8 high bits = power on start-up, 8 low bits = current switch position. 0=OFF, 1=ON
30019	Test Flag	0 = normal operation, 1 = testing board
30031	Temperature 1	Offset = -70 °C Accuracy = 0.1 °C Temperature = (register value -700)/10 (ex.: 1325 → (1325-700)/10 = 62.5 °C) Temp. value Invalid = 9588 = 888.8 °C
30032	Temperature 2	
30033	Temperature 3	
30041-42	PT100 resistance value - Temp.1	In Ω, 8 decimal bits (divide by 256)

30043-44	PT100 resistance value - Temp.2	In Ω, 8 decimal bits (divide by 256)
30045-46	PT100 resistance value - Temp.3	In Ω, 8 decimal bits (divide by 256)
30061	Temperature 1 in Ex-Bus format	Ex-Bus format (16 bit): Offset = -273°C, 5 decimal bits (divide by 32) Valid values = 0x0000 - 0xFAFE (from -273 to 1734.94°C) 0xFFAFF = Overflow, 0x0000=Underflow 0xFF00 = unavailable, 0xFE01 = disconnected
30062	Temperature 2 in Ex-Bus format	
30063	Temperature 3 in Ex-Bus format	
30101	Alarms and prealarms active for Temp.1	0=no signal 1=Alarm signal active 2=Prealarm signal active 3=signal. Alarm and prealarm active
30102	Alarms and prealarms active for Temp.2	
30103	Alarms and prealarms active for Temp.3	
30105	Relay State	0 = contact open, 1 = contact closed
30106	Relay activation (from activation threshold)	Bit 0 = 1 → activated by temp.1, bit 1 = 1 → activated by temp.2 Bit 2 = 1 → activated by temp.3
30201	Presence of CANBUS interface	1 = interface present, 0 = not present
30202	CANBUS state	0 = Error Active, 1 = Error Passive, 2 = BusOff

Modbus Registers - Holding Register		**Format**
40101	High temperature threshold from temp. 1 (Prealarm)	Thresholds format: threshold= (register value -700/10). Accuracy = 0.1 °C Offset = -70 °C
40102	Maximum temperature threshold from temp. 1 (Alarm)	
40103	High temperature threshold from temp. 2 (Prealarm)	
40104	Maximum temperature threshold from temp. 2 (Alarm)	
40105	High temperature threshold from temp. 3 (Prealarm)	
40106	Maximum temperature threshold from temp. 3 (Alarm)	
40111	Enabling and time for temp.1 prealarm	0 = threshold disabled,

40112	Enabling and time for temp.2 prealarm	> 0 = threshold enabled with response time shown in tenths of a second. (25 = 2.5 sec.)
40113	Enabling and time for temp.3 prealarm	
40114	Enabling and time for temp.1 alarm	
40115	Enabling and time for temp.2 alarm	
40116	Enabling and time for temp.3 alarm	
40121	Relay enabling	0 = disabled, 1 = enabled on alarms, 2 = enabled on prealarms, 3 = enabled on alarms and prealarms
40201	Relay activation threshold from temp.1	Thresholds format: threshold = (register value -700/10). Accuracy = 0.1 °C Offset = -70 °C
40202	Relay activation threshold from temp. 2	
40203	Relay activation threshold from temp. 3	
40206	Relay deactivation threshold from temp.1	
40207	Relay deactivation threshold from temp.2	
40208	Relay deactivation threshold from temp.3	
40221	Delta T function activation (Temp3 = Temp2 - Temp1)	0 = Off, 1 = On

3. CanBus specifications

Supported protocols: **EX-BUS, J1939**

Connection via standard J1939 or PMC bus owner

Not compatible with protocol-MTU MDEC

3.1 EX-BUS

CAN speed: **250 kbit/s**

CAN settings: **sample point at 75%, 11bit identifier (standard format)**

Messages transmitted EX-BUS:

ID	MIX	L. data	Description
0x410 – 0x41F	MXD-DITEMP	8 byte	**Temperature**: 2 bytes for each measurement. Format: offset -273 °C, resolution 0.03125 °C/bit.
0x410 – 0x41F	MXS-DITEMP	6 byte	**Diagnostics**. Contains: board type, firmware revision, CAN error counters, alarm states.

Note: each module transmits with a single ID. The ID selection is made with SWN switches 1-4 (EX-BUS ADDRESS).

For further information on EX-BUS protocol, refer to EAAS0346xxxx specifications.

3.2 J1939

CAN speed: **250 kbit/s**

CAN settings: **sample point at 75%, 29-bit identifier (extended format)**

Messages sent to J1939:

PGN65191 - Alternator Temperature (AT):

SPN 1122 - Bearings temperature 1 (DIGRIN n. 1 - SW4 = OFF)

SPN 1123 - Bearings temperature 2 (DIGRIN n. 1 - SW4 = OFF)

SPN 1124 - Windings Temperature 1 (DIGRIN n. 2 - SW4 = ON)

SPN 1125 - Windings Temperature 2 (DIGRIN n. 2 - SW4 = ON)

SPN 1126 - Windings Temperature 3 (DIGRIN n. 2 - SW4 = ON)

PGN60461 – DM1 Multipacket

Contains PGN60160 (with alarms for spn 1122.1123 or spn 1124, 1125, 1126)

4. Auxiliary Functions

4.1 Delta T

Implies only the use of thermo-resistors T1 and T2 (T3 is not connected); calculates the difference between temperatures T2 and T1 and uses the result in place of temperature T3 (therefore T3 = T2-T1).

TEMP3 Led flashes rapidly to indicate the function is activated and the temperature is estimated. The result of the difference is taken as a normal temperature, so it is transmitted instead of T3 and can be associated with thresholds. If T1 or T2 are invalid, T3 will also be invalid.

This function is activated by parameter. If the sensor connected to J3 is activated, it won't be detected.

4.2 Relay activation

The relay output is managed independently of alarms and prealarms through dedicated thresholds of activation and deactivation. Can be used to power fans or cooling systems. The thresholds are programmed in the parameters.

POSITIVE LOGIC: activation threshold > = deactivation threshold (e.g., activation threshold = 280 ° C, deactivation threshold = 240 ° C → the relay is normally open; when temp. reaches 280 °C, the relay is closed until the temp. drops below 240 °C).

NEGATIVE LOGIC: activation threshold < deactivation threshold (e.g. activation threshold = 350°C, deactivation threshold = 370°C → the relay remains closed as long as the temperature remains below 370°C. The relay opens when the temperature rises above 370°C and remains open until the temperature drops below 350°C)

5. Configuration

The DIGRIN module is configured using the switches or parameters that can be set via serial line.

5.1Switch settings

5.1.1 SWN switches for RS485 Version

SWN SWITCHES	Description
1- 5	Assign modbus device address (from 1 to 32) with SW6 = ON
6	Modbus address block: ON = from switches 1-5, OFF=1 fixed
7	Not used
8	ON = enable parameter writing

Modbus address allocation table

SWN DIPSWITCHES	ON	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	5																	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	4									x	x	x	x	x	x	x	x									x	x	x	x	x	x	x	X
	3					x	x	x	x					x	x	x	x					x	x	x	x					x	x	x	X
	2			x	x			x	x			x	x			x	x			x	x			x	x			x	x			x	X
	1		x		x		x		x		x		x		x		x		x		x		x		x		x		x		x		X

5.1.2 SWN switches for CanBus Version

SWN SWITCHES	J1939	EX-BUS	Modbus (only for jack JP)
1	Not used	ID EX-BUS (from 0x410 to 0x41F)	Modbus device address assigned from 1 to 16 (if SWN 6=ON)
2	Not used		
3	Not used		
4	OFF = tx 2 bearings, ON = tx 3 windings		

5	CanBus protocol selection: OFF=EX-BUS, ON=J1939
6	Modbus address block: ON = selected with switches 1-4, OFF = 1 fixed
7	Not used
8	ON = enable parameter writing

EX-BUS address assignment table

SWN DIPSWITCHES	ON	EX-BUS ADDRESS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	4									x	x	x	x	x	x	x	x
	3					x	x	x	x					x	x	x	x
	2			x	x			x	x			x	x			x	x
	1		x		x		x		x		x		x		x		x

5.1.3 JP serial interface configuration switch

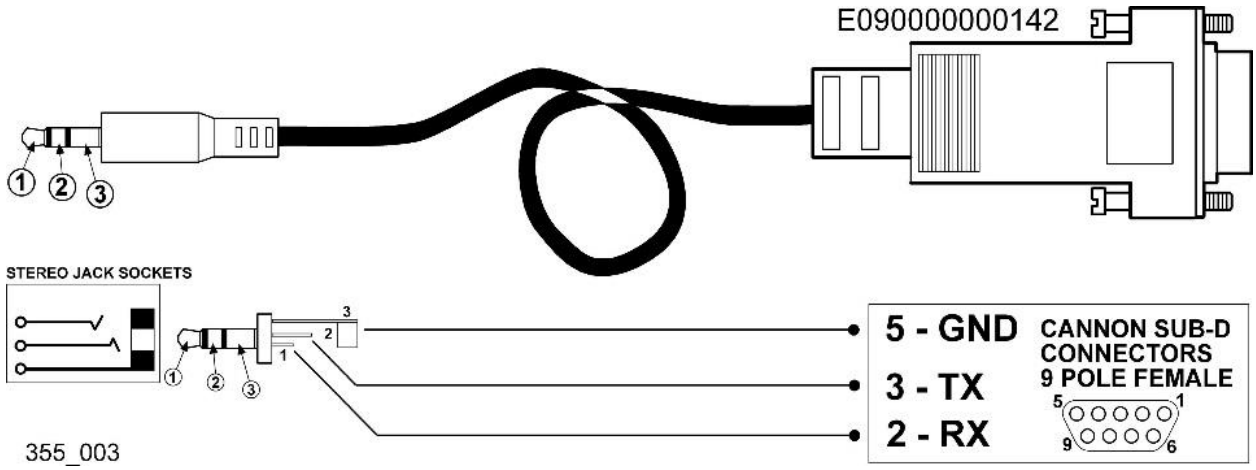
SWP SWITCH	ON	OFF
1	Insert the 120Ω compensation resistor in RS485 line	Remove the 120Ω compensation resistor from the RS485 line
2	Disable RS232/RS485 serial JP	Enable RS232/RS485 serial JP
3	Enable RS232 serial (JP)	Enable RS485 serial (JP)
4	Baud rate = 19200	Baud rate = 9600

5.1.4 Configuration

The configuration requires connection to a PC via RS232 serial port using Jack connector **JP** or RS485 serial with connector **J2** and the BoardPrg program (version 2.25 and later).

The Mecc Alte Board Programmer4 PC Software (hereinafter called “BoardPrg4”), can be downloaded for free from the Mecc Alte website www.meccalte.com . In the Software section → Mecc Alte BoardPrg4 (select the latest version BoardPrg_x_yy_z.msi).

⚠ ***Notes: Use cable E090000000142 (RS232-E20931 module connection cable) to connect via a RS232 serial port (JP Jack connector).***



- Set the serial port to be used on the PC (in **Communication Menu** → **Select Communication Resource**). Check the communication parameters: **9600, N, 8, 1**
- Set the **Modbus** address (in **Communication menu** → **Serial address**: default = 1)
- Display the parameter window (in **File menu** → **Parameter management**)
- Make the connection to the **DIGRIN** board (**Connect**).

⚠ ***Important: Read the parameters (Read command), and transfer the values to the New Value column, where you can edit them (Copy command).***

Now you can configure the device, and set:

- The alarm/prealarm thresholds, and relay output activation.
- Auxiliary functions configuration.

⚠ ***By default the alarms are disabled. To configure them use the second programming window in BoardPrg.***

After configuration, check **SWE dipswitch 8=ON** and press **Transmit**.

The configuration can be saved on a **PC** (Save), and reloaded (Load) at a later date to configure other modules in the same way.

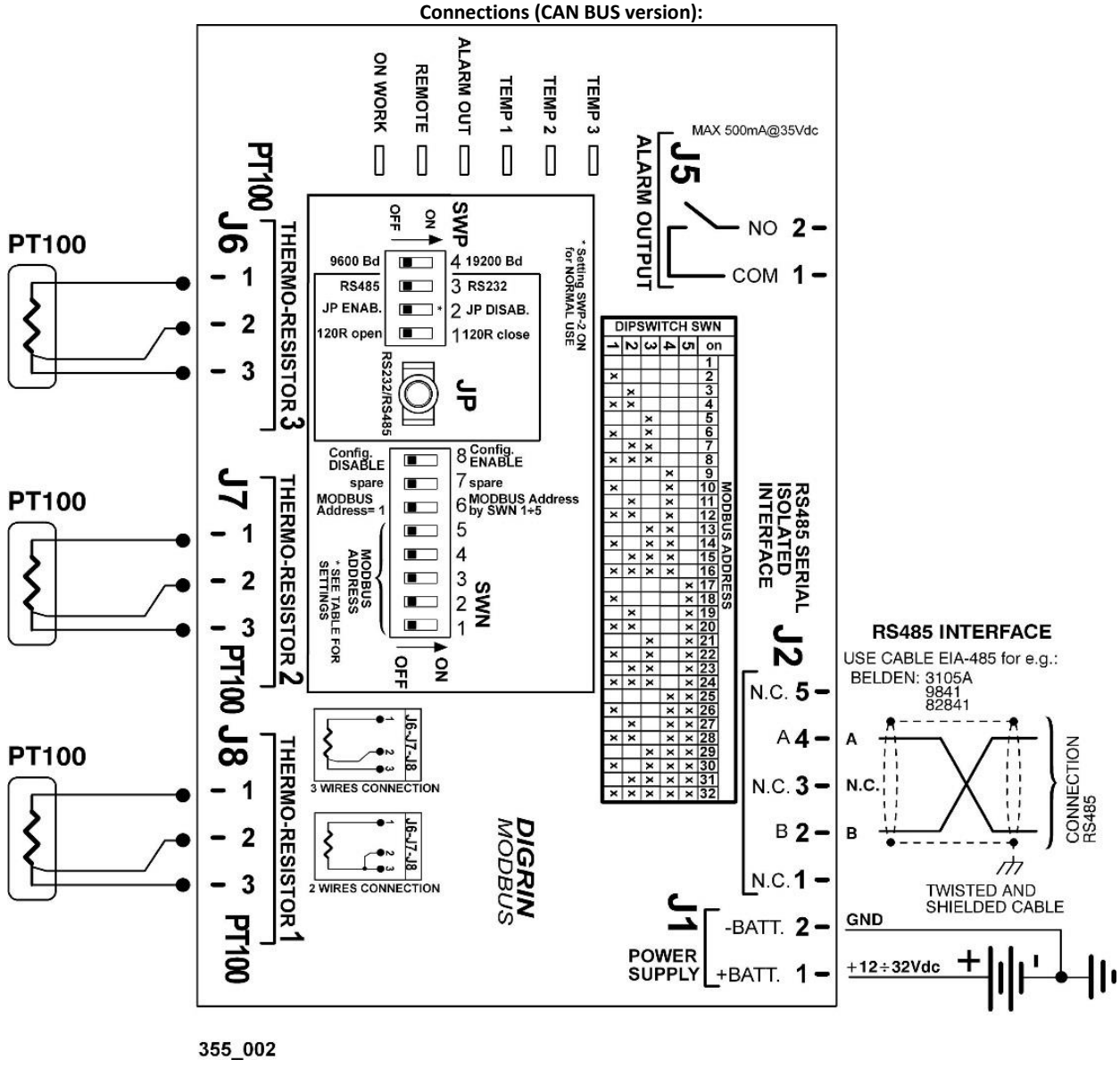
⚠ ***After programming, switch SWE dipswitch 8 OFF again to activate write protection.***

5.1.5 INSTALLATION INSTRUCTIONS

The device is designed to be mounted on a DIN 46277 guide in an upright position. It requires adequate ventilation to function properly. If possible, avoid installing above and/or near devices that produce heat.

Connections (RS485 version):

Connections (CAN BUS version):



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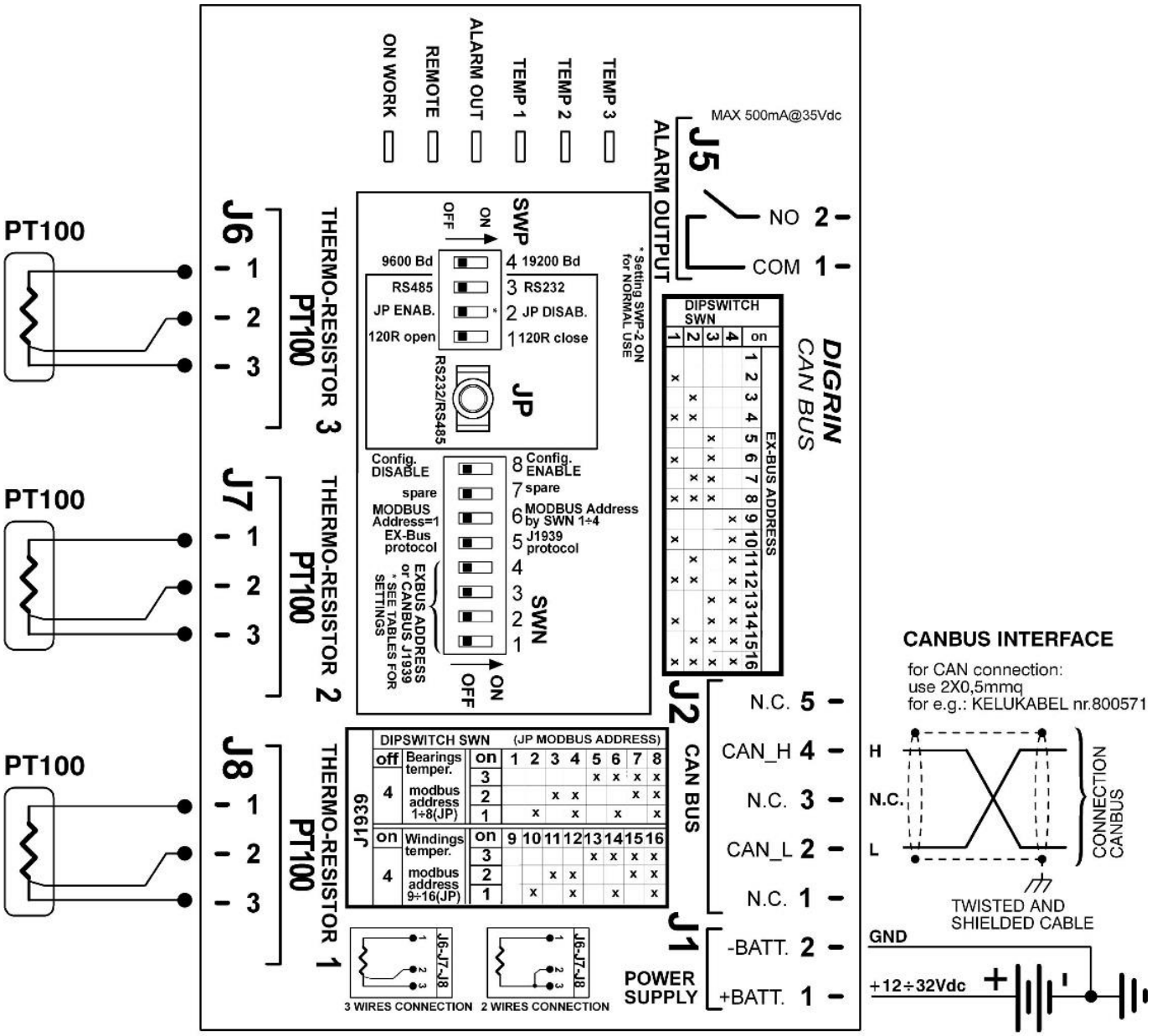
RS485/CANBUS terminations:

To minimize reflections, the first and last device in the BUS 485 network must have an **120 ohm ½ W** termination resistor connected in parallel with the line.

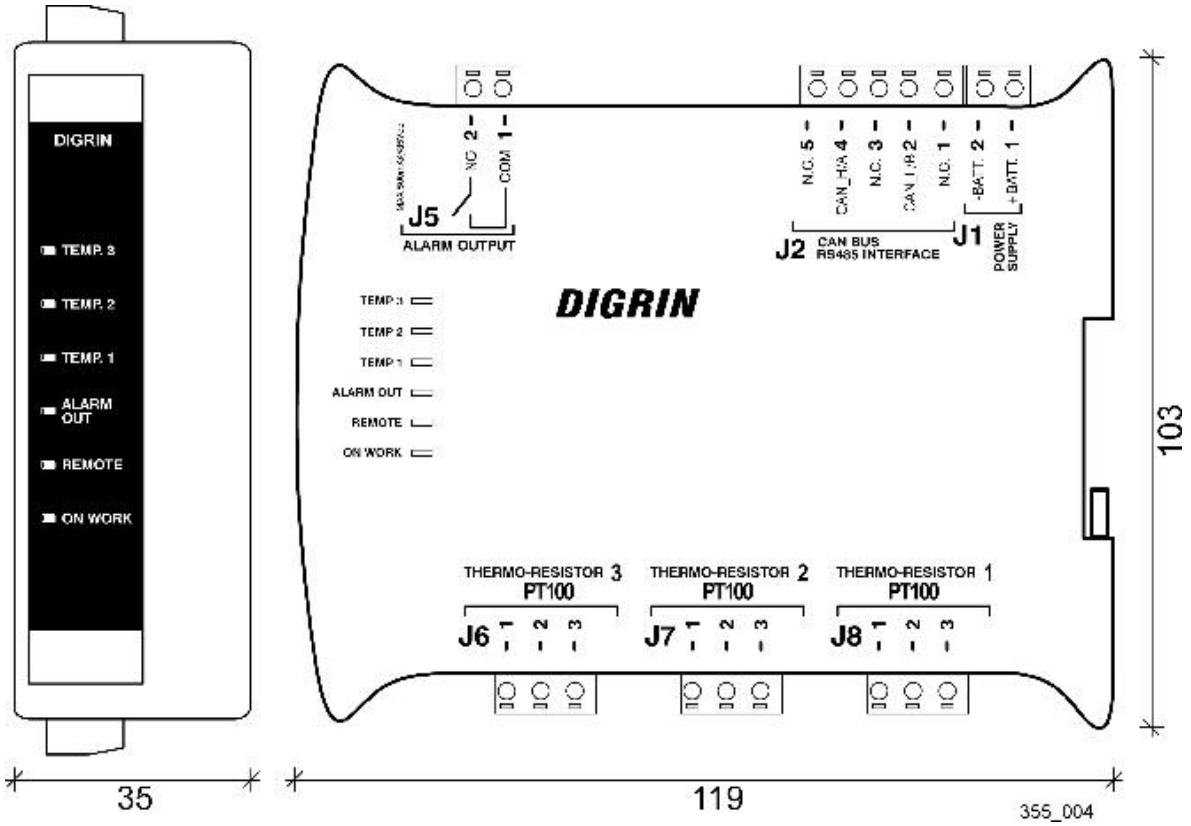
The same principle applies to the CANBUS network.

Connections (CAN BUS version):



355_001

Dimensions:


DIGRIN
TEMP. 3
TEMP. 2
TEMP. 1
ALARM OUT
REMOTE
ON WORK
J5
ALARM OUTPUT
J2
CAN BUS RS485 INTERFACE
J1
POWER SUPPLY
DIGRIN
THERMO-RESISTOR 3 PT100
J6
THERMO-RESISTOR 2 PT100
J7
THERMO-RESISTOR 1 PT100
J8
103
35
119
355_004

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(PT100 module with 3 inputs – RTU/CanBus Modbus protocol)