

# Data Transmitter

## MeteoLOG TDL 14 F

Instruction for use 9.1742.0x.xxx  
Software-Version: V1.00

10/98



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# 1. CONSTRUCTION OF THE DATA TRANSMITTER

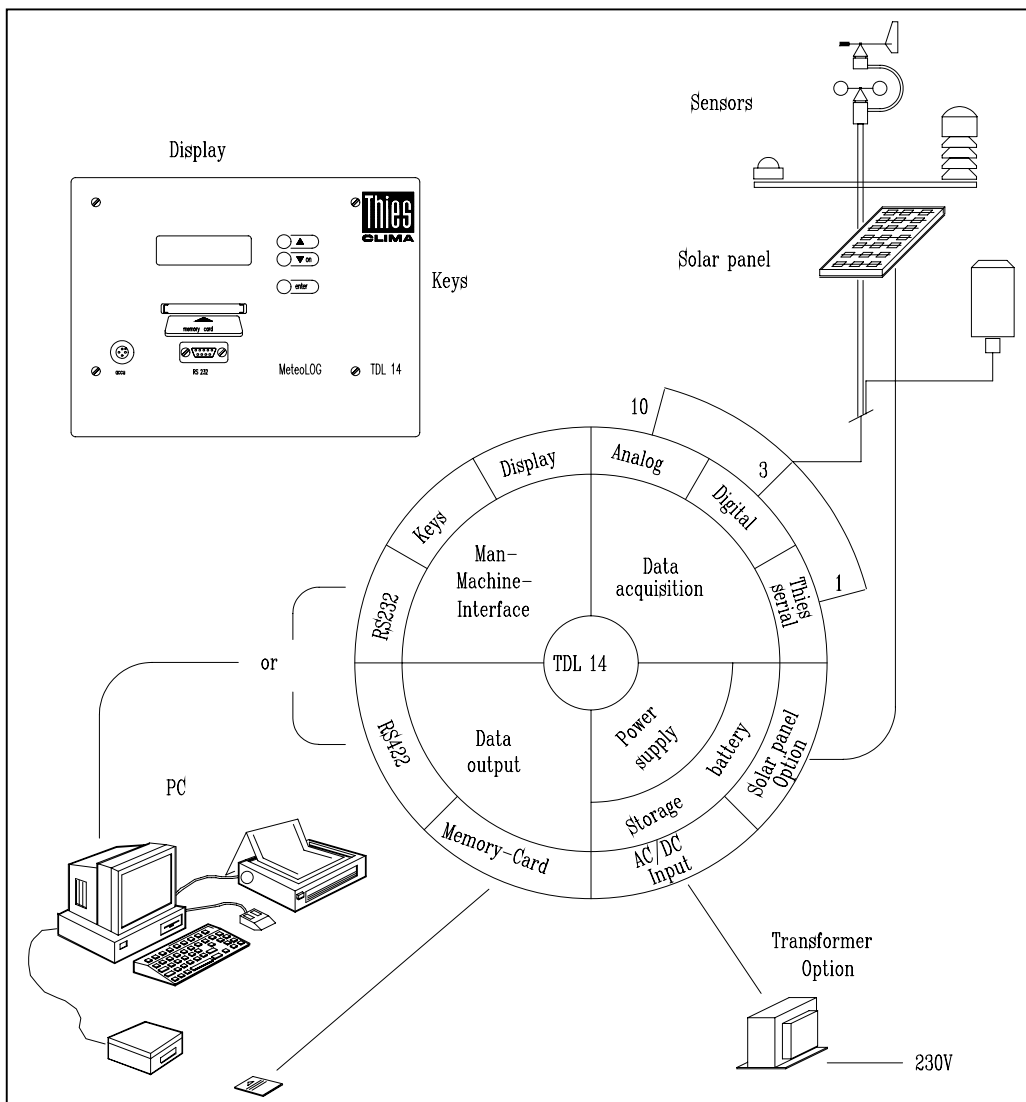
The MeteoLOG TDL 14F data transmitter is a complete measurement system to measure meteorological data and sends the instantaneous data over a serial interface. The exchangeable storage battery is situated in the data transmitter case. The case, which can be locked, is water-tight (IP65) and very sturdy. The case is made of stainless steel to protect the instrument from electro-magnetic fields. Furthermore, operation in a temperature range from -30° to 50°C is guaranteed.

The instrument is easy to operate, either with the three keys. The three keys are indicated by "<Δ>", "<∇> on" and "<enter>" in the following. The instrument has a two-line, alphanumeric display.

Numerous inputs are available for the connection of measured data transmitters (sensors). A maximum of 4 analog and 3 digital sensors can be connected. The instantaneous data can be read out over a serial interface (V.24/RS232-C and RS422).

An integrated lithium battery buffers the contents of the data memory and the clock operation when no other power supply is available. This means that the saved values and the time are not lost even when there is no additional power supply.

## Functional Arrangement of the Data Transmitter:



## 1.1 Models available

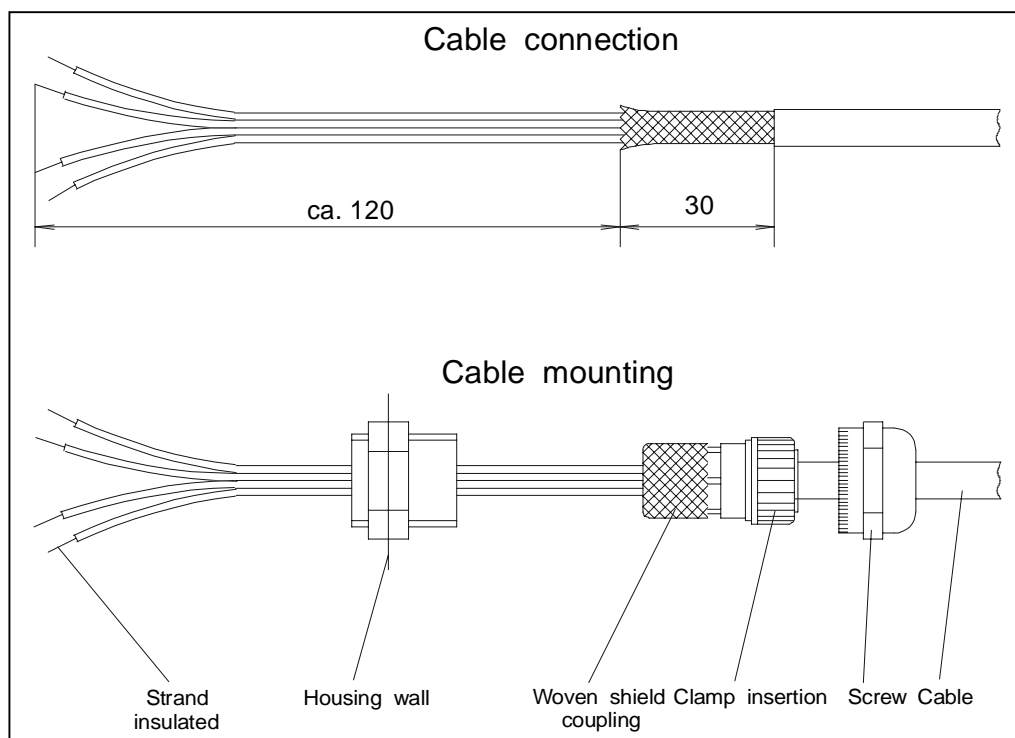
The data transmitter is available in different models geared to the requirements of the respective application:

Order-No.:9.1742.OX.000	Data transmitter TDL 14F
.X0	Power supply: 14...24 V AC/ 17...33 V AC/ integrated 12 V storage battery
.X1	Power supply: an additional integrated power transformer (230 V)
.X2	Power supply: an additional integrated power transformer (115 V)
.X3	Power supply: solar charge regulator
.X4	Power supply: solar charge regulator/ power transformer (230 V)

## 1.2 Mounting

The data transmitter is designed to be mounted to a vertical wall. Four screws of 8 mm diameter are required for this. There are special mounting sets available in the following diameters: 48, 60, 80, 90, 102 and 132 mm for installation on a mast.

The transmitter cables are lead through the appropriate cable screwing to the connecting terminals. For details, please refer to the connecting diagram. For installation in line with EMC (electromagnetic compatibility) requirements, lead the shielded cable back through the synthetic insert of the screw coupling (if necessary remove the yellow-green shielded flexible wire).



## 2. OPERATION

The data transmitter starts automatically as soon as the storage battery is connected. The data transmitter is reinitialised during this process. Once the instrument has been switched on, first the clock and the date (see section 2.2.2) should be set. Furthermore note the sensor settings and the language (see section 2.2.3).

### 2.1 Standards Displays

After the unit has been switched on, the station name appears. Where "\*" appears as the first character, this indicates that the user can change this value (see 2.2). The next display value is reached by pressing the <∇> key. You can return to the preceding value with the <Δ> key.

#### SEQUENCE OF DISPLAY VALUES:

- station name
- date and time
- status of the A/D converter
- language/memory
- channel configuration
- storage battery voltage
- baud rate
- transmitter constants: radiation CM 11
- sensor measured values:
  1. wind velocity
  2. wind direction
  3. temperature
  4. rel. humidity
  5. air pressure
  6. radiation
  7. precipitation

#### STATION NAME:

*THIES-CLIMA • DL14F V1.00a 0
----------------------------------

The station name allows the user to differentiate between the data of several stations. The name (here: „THIES CLIMA“) can be up to 11 characters long. In the second line you find the instrument model („DL 14F“), the software version („V 1.00a“) and the software variation („0“).

version 0 (9.1742.xx.0xx) Telegram Impulsphysik

**DATE / TIME:**

\*date : 01.01.93  
time : 12:00:00

Display of logger date and time.

**STATUS OF A/D CONVERTER:**

A/D: OK  
0 0 512 1023

OK (A/D converter is functioning properly)  
Err (A/D converter defective)

Self-test of the A/D converter  
Setpoint: 1021 ±2

Self-test of the A/D converter  
Setpoint: 512 ±12

Current measured offset  
Setpoint: 0 - 3

Offset, with which all other measurements will be corrected (is measured at the time when the instrument is switched on).

**LANGUAGE / MEMORY:**

Lang : English  
Memory : 128 KB

Displays the language selected (DIP switch S 4.1, see 2.2.3)

**CHANNEL CONFIGURATION:**

\*Channel-config.:  
1xxxx x7  
Sensor

X = 0 sensor not reporting  
X = 1 sensor reporting

Displays the configured measurement channels („1"→ reporting). Non-configured measurement channels („0"→ not reporting) are indicated on the display by dashes („-").

The first number to the left stands for sensor 1 (wind speed), the last for sensor 7 (precipitation).

**STORAGE BATTERY VOLTAGE**

accumulator : OK  
12.5 V

OK : Voltage >11.5 V  
!!!: Voltage 10.6 ... 11.5 V  
Low: voltage <10.5  
charge/ change batteries recommended

X = "s" or "c"  
Display of the adjusted wind velocity sensor: standard ("s") or compact ("c").  
(see section 2.2.3).

Displays the measured voltage of the storage battery. The actual storage battery voltage is higher (approx. 0.2 V). Analog measurements become imprecise below a measured voltage of 8.5 V.

**Please Note:**

*The storage battery should not be discharged below 10.5 V because, first of all, there is no appreciable capacity available anymore and, secondly, because the operating life of the battery will be considerably shortened. Please change or charge the storage battery while „!!!" still appears on the display.*

## **BAUD RATE**

* Baudrate 4800 Bd      8N1
--------------------------------

No memory card in the holder

Displays the baud rate:

Settings:

300 Bd, 600 Bd, 1200 Bd, 2400 Bd,

4800 Bd, 9600 Bd

8 data bits (no) parity,

1 stopbit

## **TRANSMITTER CONSTANTS:**

### **CONCERNING SENSOR 6: RADIATION CONSTANT PYRANOMETER CM11**

*Pyranom. const: 5.0000 mV
-------------------------------

Displays the radiation constant set on the "pyranometer CM11" sensor. The value to be set is stipulated in the sensor's test certificate.

Setting range: 4.0000...5.9999 mV/ 1000 Wm<sup>-2</sup>

## **SENSOR MEASURED VALUES:**

Please note the DIP switch setting on certain sensors (S4, see 2.2.3)

### **SENSOR 1 WIND VELOCITY**

Windvelocity: NNN.N kt
---------------------------

Outputs the mean wind speed per second (measured once a second).

S4.3 = open
-------------

S 4.3 = close
---------------

Sensor: Thies standard  
(for example 4.3303.xx.xxx  
or  
4.3336.xx.xxx)

measuring range : 0,5...116 kt

resolution : 0,2 kt

Sensor: Thies compact  
(4.3519.xx.xxx)

0,9...116 kt

0,2 kt

## **SENSOR 2 WIND DIRECTION**

Wind direction:  
NNN °

Outputs the measured wind direction (continuous measurement). "???.?" appears if there has been a measurement error (for example, the sensor is not connected, the measuring range has been exceeded etc.).

Measuring range: 0...360°

Resolution: ≤ 3° (valid for a wind direction transmitter with 8 bits)

≤ 12° (valid for a wind direction transmitter with 5 bits (compact))

*Please Note: The 5-bit transmitter or the 8-bit transmitter are identified automatically.*

## **SENSOR 3 TEMPERATURE**

Temperature:  
NNN.N °C

Outputs the instantaneous measured temperature (measurement once a second). "???.?" is output if there has been a measurement error (for example, the sensor is not connected, the measuring range has been exceeded)

Measuring range: -30...+50°C

Resolution: 0,1°C

## **SENSOR 4 REL. HUMIDITY**

rel. Humidity  
NNN.N %

Output of the current measured relative humidity (measured once a second).

When the measurement range has been exceeded, "100,0% r. H." appears on the display.

Measuring range: 0,2...100% r. h.

Resolution: 0,1%

## **SENSOR 5 AIR PRESSURE**

Air pressure:  
NNN.N hPa

Outputs the instantaneous measured air pressure (measurement once a second). ????.? appears if the measurement range has been exceeded or not reached.

Measuring range: 800...1060 hPa

Resolution: ≤ 0,3 hPa

## **SENSOR 6 RADIATION**

Radiation  
NNNN W/sm

Outputs the measured radiation (measurement once a second). The measured value depends on the radiation constant of the transmitter (for the setting, please see TRANSMITTER CONSTANTS).

Measuring range: 0...>1328 Wm<sup>-2</sup>

Resolution: : ≤ 2 Wm<sup>-2</sup>

## **SENSOR 7 PRECIPITATION**

Precipitation: NNN.N mm
----------------------------

Outputs the amount of precipitation which has fallen during the current day.

(The sum of all precipitation since midnight, continuous measurement).

Measuring range: 0...999,9 mm

Resolution : 0,1 mm

## **2.2 CHANGING THE PARAMETERS**

All display values which appear with a „\*“ to the upper left can be changed.

These values are:

Station name, date, time, baud rate, channel configuration, radiation constant.

To edit the displayed value, simply press <ENTER> and the <▽> key. The value to be changed is indicated by the flashing cursor. Now release both keys. The value can be raised with the <Δ> or lowered with the <▽> key. If the set value is satisfactory,, then press the <ENTER> key to leave the editing mode or to select the next variable.

### **2.2.1 STATION NAME**

The station name is used to identify the measuring site. If several data loggers are in use, each of them should be given a different name. All letters and numbers as well as the underlining " \_ " and the space bar can be used for the name.

### **2.2.2 DATE**

If an invalid date is entered (for example: 31.4.92), the computer automatically corrects it to the next valid date (for example: 1.5.92).

### **2.2.3 DIP-SWITCH SENSOR SETTINGS AND LANGUAGE**

Below the front panel of the data logger there is an 8-pole (S4) and a 4-pole DIP switch (S5) to configure a number of sensor settings and the output language.

S 4.1	output language
open	German
close	English

Display output appears in accordance with the switch setting.

S 4.2	Filter Wind velocity
open	allways

S 4.3	wind velocity sensor (sensor 1)
open	Thies standard (4.3303. / 4.3336.)
close	Thies compact (4.3519.)

All other switches are not used.



## 2.2.4 CHANNEL CONFIGURATION

In order to be able to change the channel configuration, you must first simultaneously press the <ENTER> key and the <▽> key and then do the following:

The second line is deleted and a question mark appears. Now press the <▽> and the <Δ> keys simultaneously for 10 seconds. The countdown appears on the display. After the countdown is concluded, you can adjust the values as you usually do.

During this configuration no telegram is sent over the serial interface.

## 2.3 DATA OUTPUT

The Datalogger provides two interfaces to read out the serial data:

- RS232 (V.24)
- and
- RS422 (V.11)

### 2.3.1. CONNECTING CABLE OF THE SERIAL INTERFACE

RS232 / V.24 - Output:

PC/TERMINAL Sub-D25 (25-pol)	TRANSMITTER terminal strip	TRANSMITTER RS232 Sub-D9
TxD 2 ■	_____	■ 9 RxD 2
RxD 3 ■	_____	■ 11 TxD 3
ground 7 ■	_____	■ 13 ground 5
Sub-D9		
RxD 2 ■	_____	■ 9 RxD 2
TxD 3 ■	_____	■ 11 TxD 3
ground 5 ■	_____	■ 13 ground 5

RS422 - Output:

Interface- converter IC-485SI (9.1702.20.000) RS422	TRANSMITTER Terminal strip
shield •	— ■ 15 protective ground PE (respectively connect to PG screw coupling)
TxD+ 1 ■	_____ ■ 8 RxD+
TxD- 2 ■	_____ ■ 10 RxD-
RxD- 3 ■	_____ ■ 14 TxD-
RxD+ 4 ■	_____ ■ 12 TxD+
Ground ■	_____ ■ 13 ground

**Please Note:** Shielded cable should be used. For line lengths exceeding 100 m, twisted wire in pairs should be used (RxD+/RxD-, TxD+/TxD-). The connection of the shield (pin 15) to protect the instrument from surges (for example lightning) is also important. The manufacturer is not responsible for damages resulting from surges.

### 2.3.2 Serial Data Format

Output of instantaneous values every second (Telegram Impulsphysik)

Number of Byte	Values/ Character	Commeths
1	STX	Start of text (0 2H)
2	Station	First 4 Characters of station name
3	"	
4	"	
5	"	
6	Space	
7	Day	Date
8	"	"
9	"."	Point
10	Month	Date
11	"	"
12	"."	Point
13	Year	Date
14	"	"
15	"	"
16	"	"
17	Space	
18	Hour	Time
19	"	"
20	":"	Colon
21	Minute	Time
22	"	"
23	":"	Colon
24	Second	Time
25	"	"
26	Space	
27	Windvelocity	Windvelocity [kt]
28	"	
29	"	
30	"."	Point
31	Windvelocity	1/10
32	Space	
33	Winddirection	Winddirection [degree]
34	"	
35	"	
36	"."	
37	Winddirection	1/10
38	Space	
39	Temperature	Temperature [°C]
40	"	
41	"	
42	"."	Point
43	Temperature	1/10
44	Space	
45	rel. Humidity	rel. Humidity [% v. H.]

46	"	
47	rel. Humidity	
48	"."	Point
49	rel. Humidity	1/10
50	Space	
51	Airpressure	Airpressure [hPa]
52	"	
53	"	
54	"	
55	"."	Point
56	Airpressure	1/10
57	"	1/100
58	Space	
59	Radiation	Radiation [W/m <sup>2</sup> ]
60	"	
61	"	
62	"	
63	Space	
64	Precipitation	Precipitation (sum since midnight) [mm]
65	"	
66	"	
67	"	
68	"."	Point
69	Precipitation	1/10
70	Space	
71	CSH	Checksum High (see Text below)
72	CSL	Checksum Low (see Text below)
73	CR	Cariage Return (0DH)
74	LF	Linefeed (0AH)
75	EOT	End of Transmission (04H)

- All output characters in ASCII-code.
- Leading zeros in the measured values are replaced by spaces (020H).
- Erroneous values are masked with "F".
- Seperator is space (020H).
- Lenght of telegram constant (75 Bytes).
- Checksam calculation:  
Sum of all Bytes (Byte 71/72: Zero).  
Complement and Inkrement (Tmo's-Complement).  
Low-Byte in ASCII is CSH and CSL.

## 2.4 CHANGING THE STORAGE BATTERY

The storage battery, at the latest, has to be replaced when the indicated storage battery voltage drops below 9.0V. However, the storage battery should not be discharged below 11.0 V as there is no appreciable capacity available anymore. The operational life of the storage battery is considerably reduced when operated below 10.5 V! The new storage battery should be "freshly" charged once more as, owing to self-discharge (approx. 3% per month), it may not have its maximum capacity. Without the storage battery, no measurements are carried out. Before the storage battery is connected, press the <∇> ON key and hold it down. After the battery has been connected and the key released once again, the data transmitter starts. No

power is drawn from the buffer battery when the storage battery is connected (or when there is an external power supply); i.e. during this time, only the self-discharge factor is of importance for the operational life. The buffer battery can only be replaced by the manufacturer. When no power is drawn, the operational life of the buffer battery is 10 years.

**Please Note:** *During installation it is important to make sure that all terminals are switched voltage-free and that individuals and/or instruments are not endangered!*

## **2.5 EXTERNAL POWER SUPPLY**

### **2.5.1 DATA TRANSMITTER WITHOUT TRANSFORMER (9.1742.x0.xxx)**

The input for external power supply can be used to charge the storage battery and to supply the data transmitter with current. The terminal is situated below the cover plate for the sensor connections (pin 1 and 2).

The power supply must supply a current of at least 500 mA. The voltage range for direct voltage is 17 to 33 V DC and for alternating current voltage 14 to 24 V AC. Above pin 3 of the terminal there is a red light-emitting diode (LED). This controls the external power supply (LED lights up). The storage battery must always be connected. To switch the data transmitter on, first connect the storage battery. Then the external power supply can be switched on. Switch-off takes place in reverse order.

### **2.5.2. DATA TRANSMITTER WITH TRANSFORMER (9.1742.x1.xxx/ 9.1742.x2.xxx/ 9.1742.x4.xxx)**

The AC mains voltage on the transformer generates two low-voltages to supply power to the sensor heaters (26 V AC) and to the data transmitter (14 V AC). We recommend a medium antisurge 1 A-fuse (1 A mtr) to protect the mains voltage.

**Please Note:** *The connection of protective earth PE to the transformer is absolutely imperative for safety reasons!*

### **2.5.3 DATA TRANSMITTER WITH SOLAR PANEL (9.1742.x3.xxx/ 9.1742.x4.xxx)**

The solar panel is connected over pin 3 and pin 4 on the terminal strip. In the integrated charge regulator in the data logger, the charging voltage changes with the temperature. That is why the storage battery should always be in the data transmitter case.

**Please Note:** *The integrated regulator is designed for a solar panel with nominal data 12V/5W. The use of a different panel could destroy the electronics!*

*General information of the solar panel:*

*Solar panels in use in the Northern Hemisphere should be aligned towards the South. For winter operation (with limited solar radiation) we recommend that you set an elevation angle adapted to the site (for Germany approx. 50°). Be careful that the arrangement of sensors or traverses above the panel does not cast shadows. Clean the surface of the solar panel as required (to remove snow, leaves etc.).*

## 2.6 CHANGING THE FUSE

If nothing appears on the display, this could mean that the fuse (situated above pin 6) has blown. (condition: storage battery not discharged).

To check whether this is the case, open the slide lock (press down and rotate towards the left) and remove the fuse. Check the fuse with a measurement instrument to test the flow of current (a visual check usually does not suffice!).

If the fuse is defective: exchange it for one of a similar type (100 mA). If the data transmitter still does not go on:

Disconnect all sensor and serial connecting lines. Check the fuse again. If the data transmitter now switches on, then connect the cable one by one to the sensors until the fuse blows again to pinpoint the defective sensor. Return the defective sensor to the manufacturer for testing.

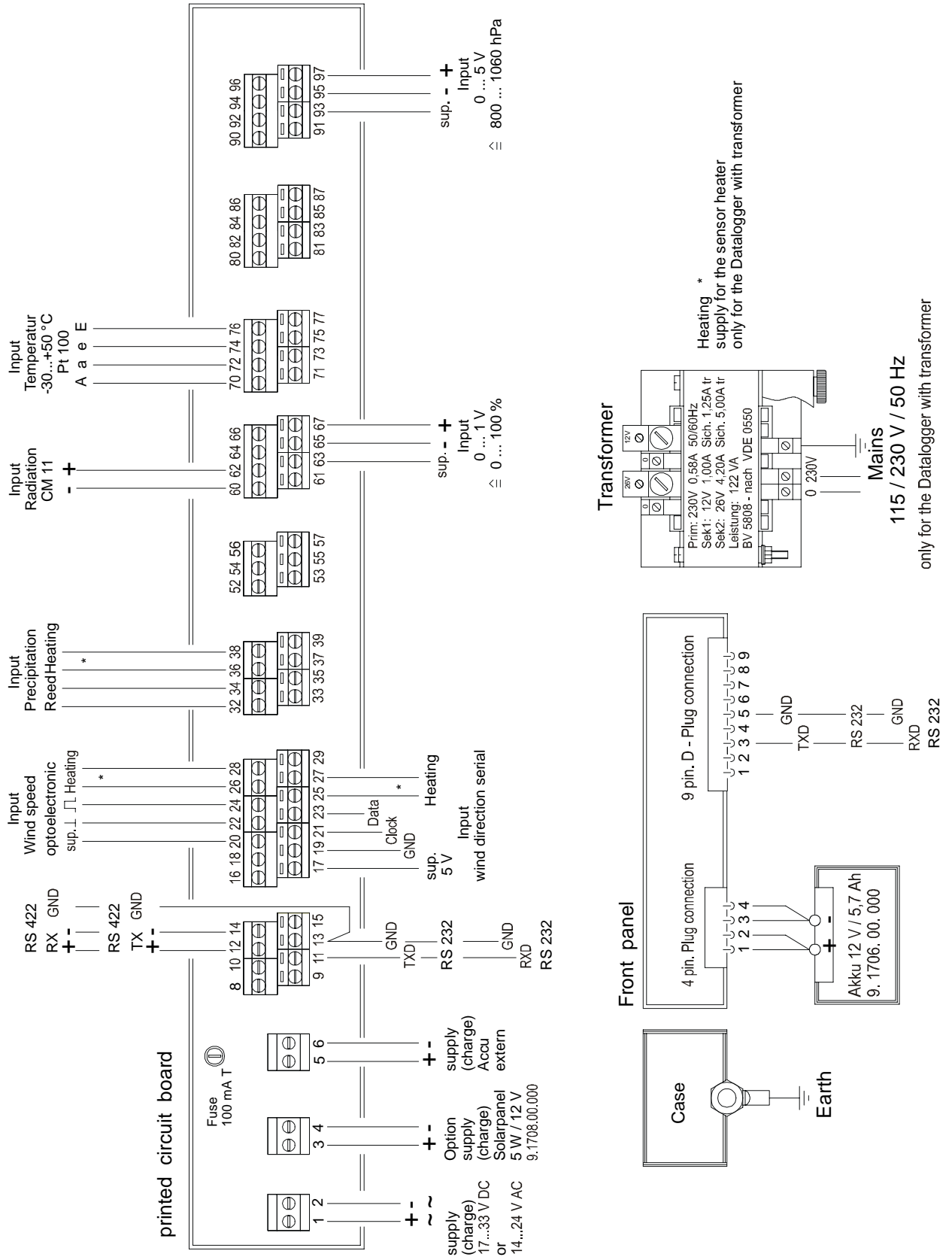
If the data transmitter still does not switch on, return it to us for a check.

**Please Note:** *The blowing of a fuse as a result of a direct or indirect bolt of lightning is a normal protective function.*

## 3. TECHNICAL SPECIFICATIONS

Case	: stainless steel, rustproof
Type of protection	: IP 65
Power supply	
Internal storage battery	: 12V/ 6,5Ah (lead gel)
Buffer battery	: 3,6V/ 0,75Ah (lithium)
Operating voltage	: 9,0 V...15 V (storage battery connection)
External power supply	: 14...24 V AC / 17...33 V DC
External mains	: 230 V AC (with optional transformer (9.1742.x1.xxx/ 9.1742.x3.xxx) or 115 V AC (9.1742.x2.xxx)
External solar panel	: 12 V/ 5 W (with optional solar regulator) (9.1742.x3.xxx/ 9.1742.x4.xxx)
Power consumption	: 30 mA (without sensors)
Operating life	
Storage battery	: nominal 9 days (at 20°C ambient temperature)
Operating temperature	: -30...+50°C
Storage temperature	: -40...+70°C
Analog measured values	
A/D converter	:
Resolution	: 10 bit (1024 steps)
Meas. Accuracy	: ± 0,2% of the measurement range
Channels Anal.	: 4 Temperature Pt 100 Radiation transmitter CM11 Humidity (0-1V) Air Pressure (0-5V)
Digital measured values	
Channels	: 3 synchronous-serial (wind direction) 16 bit counter (wind velocity) 8 bit counter (precipitation)

Display	: Displays date, time, battery voltage Sensor values in LC-display (2x16 characters)
Operation	: Setting date, time, Baud rate Station name via 3 keys
Time base	: Real time clock with automatic leap year adjustment, Powered by the buffer battery (Accuracy $\pm 10$ ppm = $\pm 0,9$ s/ 24 h (25°C))
Memory	: 128 KB
Measurement cycle	: 1 second
Data output	: every second instantaneous values
Serial interface	: 300...9600 Baud 8 data bits, no Parity, 1 stop bit RS 232/ V.24 (3-wire, TXD/ RXD/ Gnd) (transmission distance: 15 m) and RS 422 (5-wire, TXD+/ TXD-/ RXD+/ RXD-/ Gnd) (transmission distance 1000 m)
Operation	: 3 keys on the instrument





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