

Simprop electronic
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Operating Manual PLL-Synthesizer PPM-FM Receiver

SCAN 7



SCAN7 35MHz JR Order No. 012 209 2
SCAN7 40/41MHz JR Order No. 012 210 6

Technische Änderungen vorbehalten / Technical content subject to change
T-Nr.: File: 6804004_Anleitung_SCAN7_030307.DOC

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1. General Matters & Safety Instructions

High-End FM Receiver in Miniature Format

The Scan 7 is a completely new development in PLL synthesizer PPM receiver using the most modern technology. It is suitable for all normal transmitters on the market using FM or PPM operation. The SCAN 7 looks like a micro receiver, but is in fact a fully-fledged, no-limits, quality receiver that can be used in any model class. Sensitive, expensive plug-in crystals are no longer necessary!

A special highlight is the "DAT" digital interface. With it, you can display operational information such as channel number, field strength, voltage, number of disturbances, faults and software version in clear text on the Simprop *Info-Terminal*. You can also transmit information by telemetry to the *Info-Terminal* using the Simprop *VT-1* system so that up to date information on the receiver can be acquired during the flight/run.

Read through the operating instructions carefully before you start using the controller. This way you get to know the receiver functions, avoid mistakes and are less likely to endanger people and property. Please take note of the following advice:

- **The receiver is exclusively for use in R/C controlled models and may not be used elsewhere! Make a note of the frequencies approved for your model type.**
- **Always make sure that the receiver power supply is in perfect running condition. Important: If you use too thin battery and control cables (0.14mm²=servo cable) or batteries that are not up to the job, it is not possible to guarantee the proper functioning of the device!**
- **Pay special attention to the instructions in the chapter "Aerial". The aerial is the most important and most sensitive component in the receiver.**

- If an electrically-driven model is used in conjunction with the receiver, electric motors must be properly suppressed before use so that the reception is not impaired.
- The receiver must be placed at least 10cm away from any electric motor or electric controller. The greater the distance, the less the interference.
- Before using for the first time, carry out a range test of the completely assembled model with the motor running (if there is one built in).
- Never carry out the scanning process when an internal combustion engine or electric motor is running.
- If a transmitter is installed in the model (telemetry system), it must be placed at least 15cm from the SCAN7 (including aerial). Use only frequency modulated (FM) transmitters with approved frequencies.
- The receiver may not be exposed to strong magnetic fields, regardless of whether it is switched on or off. Minimum distance from, for example, powerful electric motors is roughly 10cm.

2. Technical Data

Frequency range	35 MHz Band / 35 MHz B-Band or 40/41MHz Band - see frequency table
Procedure	Superheterodyne with PLL technology
Servo outputs	6 / 7 with Y cable
Operating mode	FM / PPM
HF channel separation	10 kHz
Operating voltage	3.5 -7.5V (4 -5 nicad cells)
Current consumption	approx. 20mA
Sensitivity approx.	2 μ V
Intermediate frequency	455 kHz
Dimensions (L x B x H)	65 x 22.5 x 12 mm
Weight	18g (13g without housing)
Aerial	850 mm (red for 35MHz, green for 40/41MHz)
Temperature range	-10° - +55°C
Approval	not required, corres. to BAPT 222 ZV 129
EMC	ETS300 683 Type 1 / Class 1

3. Features and Characteristics

- Intelligent pulse decoding with digital post-processing. Evaluation of the reception quality and storage of the past signals can be used to reconstitute reception signals to the microcontroller and so largely eliminate disturbances.
- 100% SMD components, giving a very flat design with high functional integrity and very good vibration resistance.
- TOP range without restriction of about 1000 metres at a height of 1 metre when the aerial is optimally positioned. Compare this with other receivers!
- Active input control prevents overloading the input stages when there are powerful neighbouring channels or VHF transmitters.
- All channels in the 35MHz A and B bands or the 40/41MHz band (at the normal frequency raster) can be programmed (SCAN) by pressing a button on front of the receiver. As an option, an external programming key can be connected up to change channels on receivers which are difficult to access.
- The scanned-in frequency (received channel) is stored in a non-volatile memory and naturally remains stored, even when the battery is disconnected.
- Servo terminal strip without current limiting. All servo plugs have an over-dimensioned cross-sectional area so that the current load capability is only limited by the battery and servo sockets and limited to about 3A per plug and socket.
- High-performance flash microcontroller, software can be updated.
- 6 / 7 Servo outputs. The 7th channel can be configured as channel or as data output (DAT). To use all 7 channels, the battery must be connected via a Y-cable.
- Data such as channel number, field strength, voltage, number of disturbances, faults and software version are provided via the DAT output when in 6-channel operation. These can be displayed directly or by telemetry (VT-1) in clear text **via the Info-Terminal in the display**.

- LED as status and battery display.

Battery display only in 6-channel operation:

4 Cells

5 Cells

3x flashing:	Battery fully charged,	Voltage	>5.0V	>6.2V
2x flashing:	Battery partially discharged	Voltage	<5.0V	<6.2V
1x flashing:	Battery almost discharged	Voltage	<4.5V	<5.7V

STOP!

Permanently lit: battery fault - voltage temporarily under 4.0V or 5.0V, resp. **STOP!**

The display "Permanently lit" for voltage drop-outs under 4V (5.2V for 5 cells) is permanently stored. After the model has been in use, you can read off whether voltage drop-outs have occurred. The display is only reset when the battery is disconnected.

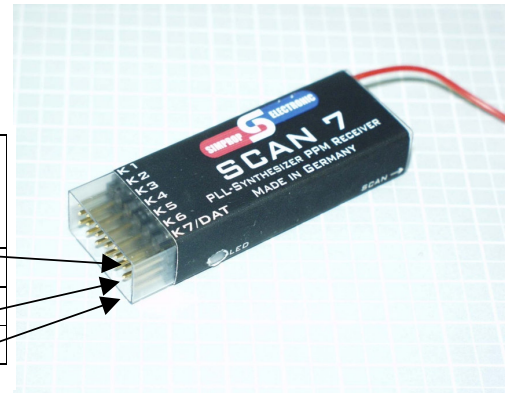
- ⇒ Display during scanning: Rapid flashing of the LED at about 10x per second
- ⇒ Display in 7-channel operation: LED is lit with reduced brightness

- Made in Germany

4. Connector Terminals

In general, the terminals are allocated as follows:

		Graupner colour	Futaba colour	Hitec colour
Upper	Minus	brown	black	black
Middle	Plus	red	red	red
Lower	Pulse	orange	white	yellow



Servos:

The terminals marked K1 to K7 are the outputs of the respective channels. The connection marked "DAT" has, in addition, a special function that will be described later on.

Battery:

The receiver battery can be plugged into any terminal (= output). If all outputs are occupied by servos, the battery can be connected via a Y-cable. Permissible receiver batteries: 4 or 5-cell nicads or NiMH.

Controller with BEC:

Can be plugged into any terminal. Please note: The power supply via BEC is usually limited to a few servos.

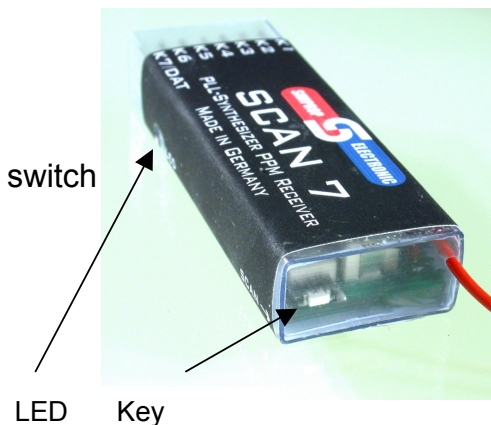
5. Frequency Setting SCAN

Following a channel scan, the SCAN 7 behaves just like any normal quartz crystal receiver. The stored frequency is set each time the device is switched on. The storage memory is not erased when the battery is disconnected. Advantage of a PLL receiver: the frequency is continuously checked and controlled to the correct value when deviations occur.

During channel scan, your own transmitter must be placed much nearer to the receiver than any other transmitter that may also be in operation at the time. In case of doubt, pull out the aerial and take the transmitter and receiver to a distance of at least 10 metres from the other transmitters and repeat the frequency scan.

• 6-Channel Operation

1. Switch on transmitter, screw in aerial.
2. Plug the receiver battery into one of the channels and switch on.
3. Press the key for about 3 seconds till the LED on the side of the receiver starts to flicker – let go of the key. The receiver now scans in the transmitter and is ready to go in 6-channel operation after a further 3 seconds - finished !!!



• 7-Channel Operation

With the SCAN mode described above, only the channels 1 to 6 are activated. The 7th output supplies data for the *Info-Terminal* or can be used as a battery connection. If all 7 channels are occupied, the SCAN process takes a rather different course:

1. Switch on transmitter, screw in aerial.
2. Plug the receiver battery into one of the channels and switch on.
3. Press the key for about 6 seconds. LED display: After about 3 seconds, the LED on the side of the receiver starts to flicker (=SCAN operation). After about a further 3 seconds, the SCAN process is complete and the LED glows slightly. You can now let go of the key. The receiver is ready for use with 7 channels. In the 7-channel mode, the battery indication from the LED is no longer there and the data output DAT is replaced by the servo output channel 7. The LED is continuously on with reduced brightness.

6. External Key – not supplied with the receiver –

In models where access is a problem, the built-in key is sometimes difficult to get at. The external SCAN key is a help here, Order No. 012 215 7. This key is simply plugged into the "DAT" output of the receiver and functions then like the built-in one. Prerequisites: The receiver must be in 6-channel mode.

To scan, switch on the transmitter + receiver and press the key for at least 4 seconds or longer. The receiver now scans in the transmitter and is ready to go in 6-channel operation 3 seconds after releasing the key - finished !!!

For do it yourself owners:

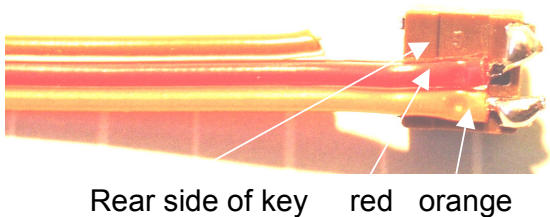
Any good quality key with a normally-open contact can be used. A normal, commercially available JR or Futaba servo cable is soldered to the key with the following colour-coding:

JR cable: Orange and red are short-circuited with the key, brown is not necessary.

Futaba cable: White and red are short-circuited with the key, black is not necessary.

Hitec: Yellow and red are short-circuited with the key, black is not necessary.

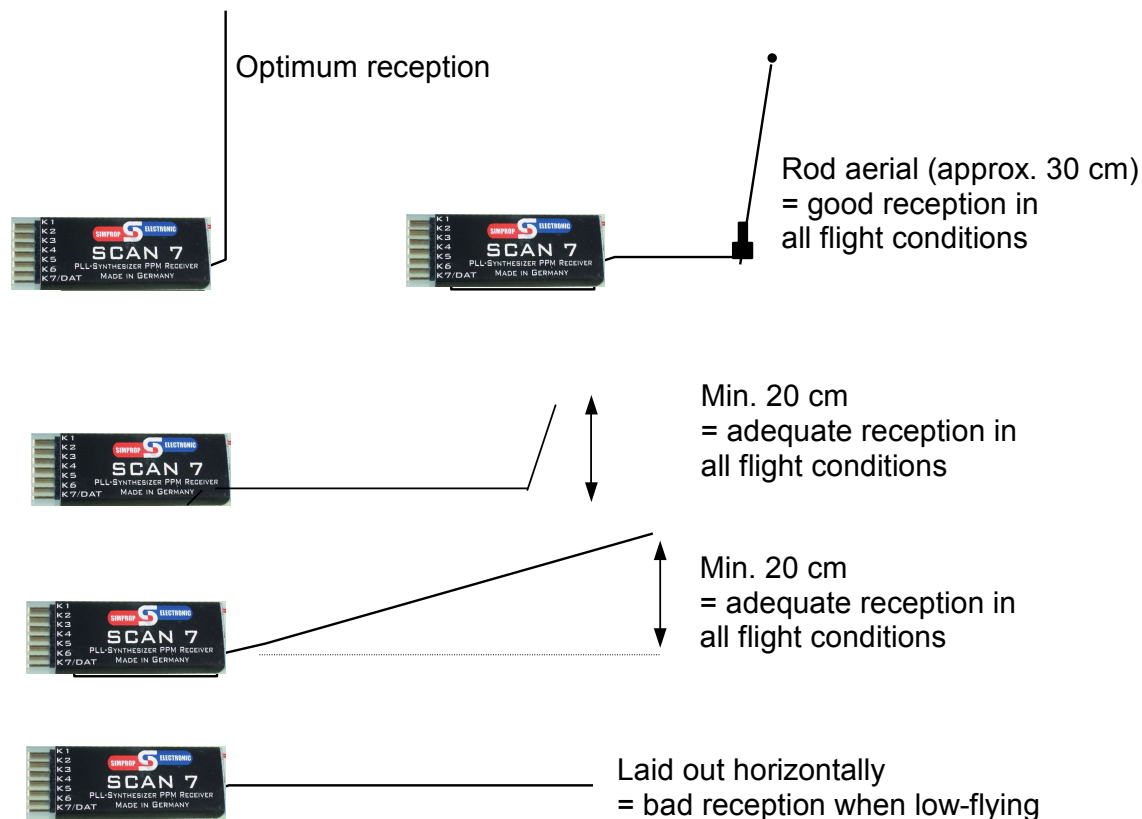
All soldered points and superfluous bare wiring must be insulated using shrink sleeving!



Confectioned "SCAN cable" Order No. 012 215 7

7. Aerial

The reception quality is for the most part dependent on the aerial and how it is laid out. The aerial length must on no account be altered. Changes in aerial length always have a bad influence on reception as the receiver is tuned to the aerial length of 85cm. If a rod aerial is used, the aerial cable must be shortened by the length of the rod. The aerial cable to the rod may not be rolled up; it must be laid out flat up to the rod aerial.



Carry out the Field Strength Test!

With the Simprop Info-Terminal you can read off and compare the field strength (reception quality). In that way, you can specifically compare various aerial positions and choose the most favourable for your model.

Special notes for models

with electric drives

- Place the receiver at least 10cm from the motor and controller
- Place the receiver as far as possible from the battery and its cables
- The motor must be satisfactorily interference-suppressed
- Carry out a range test with the motor running ($\frac{3}{4}$ throttle) before using a model for the first time.
- At high currents and at voltages above 15V, a controller with opto-coupler should be employed.

with internal combustion engine

- Only use carburettor actuators with plastic links

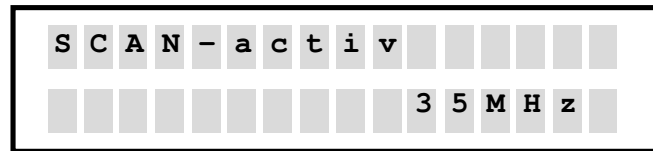
- Protect receiver against vibration
⇒ specially for petrol engines
 - Place the receiver as far as possible from the electronic ignition
 - Only use resistance plugs and screen the ignition cables

8. Operation with Info-Terminal (not supplied)

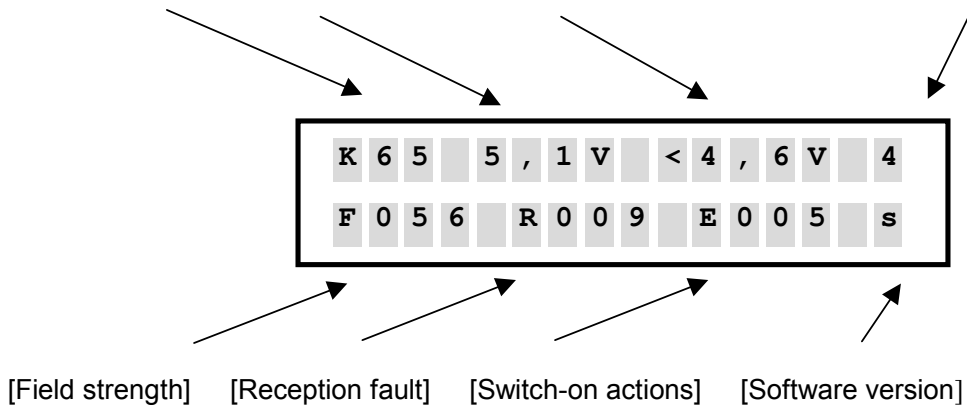
The SCAN 7 is fitted with a serial interface. Data provided by the receiver can be transferred to the Simprop *Info-Terminal* Order No. 011 969 5 . The JR cable from the *Info-Terminal* is simply plugged into the "DAT" output of the receiver. Prerequisite: The receiver must be in 6-channel mode.

SCAN 7 provides the following information:

On scanning



Operation [Channel] [Battery voltage] [Minimum battery voltage] [Number of cells recognised]



- [Channel]
Display of the set channel corresponding to the frequency list, see appendix. Special frequencies are shown with a "K ex" for *external*.
- [Battery voltage]
Displays the current battery voltage
- [Minimum battery voltage]
Displays the lowest battery voltage that has occurred; is reset each time the unit is switched on.
- [Number of cells recognised]

When the receiver is switched on, it tests the battery. It decides whether 4 or 5 cells are connected in order to adjust the LED battery display accordingly.

- [Field strength]

The field strength is the value for the reception quality. The higher the value, the better the reception. The value is, however, not linear, i.e. it can only be used to make a comparison. This indication is of valuable assistance in laying out the aerial in the model. Important: the distance transmitter-receiver must always remain the same when doing this, e.g. 50 metres. Note: When the transmitter is switched off, the value does not reset to 0; a value of about 7 appears – determined by background noise.

- [Reception fault]

Reception check, reception fault (RX-Fail) - SCAN 7 continuously monitors the input signals and stores, during the flight, how often reception disturbances occur based on a special evaluation process. Reception disturbances are pulse drop-outs or false pulse widths that occur, for example, in areas of poor reception or when more than one unit uses the same frequency. After the flight, the number of disturbances can then be read off the *Info-Terminal*. The counter is only reset when the receiver is switched off.

Evaluation of the RX-Fail display in the Info-Terminal:

In the ideal case, the RX-Fail display shows zero faults. In practice, however, there are always short reception black-outs affecting a model aircraft that the pilot may not even notice. For this reason, it is completely normal when the Info-Terminal displays several RX faults. You can, however, try to improve this value by altering the aerial position, suppressing the electric motors and screening ignition cables.

The RX-Fail counter counts a maximum of one disturbance or failsafe per second to prevent overflow on the counter caused by fast, recurring signals. If the RX-Fail display always shows a high value (>60), the cause should be determined by a range test and replacing components. In case of doubt, the transmitter and receiver should be returned for servicing.

- [Switch-on operations]

This counter is for the fault detection in the power supply. Any interruption in the battery feed lines, for example a bad switch contact, raises the counter value by one. The counter value is also raised by one when the voltage collapses to a value under 3V. When scanning, the counter is reset.

- [Software version]

The version of the software is displayed, a single letter as a rule.

9. Technical Expressions

PLL	Phase Locked Loop
Synthesizer	artificial production, in this case of the frequency
Field strength	Amplitude of the reception signal
Scan	Searching, scanning
Superhet	Receiver technology which uses an intermediate frequency
mAh	Milliampere hours / energy unit (1000mAh = 1Ah)
Internal resistance of batteries	Small internal resistance = high load carrying capability
LED	Abbreviation for light emitting diode

10. Colour Coding of the Servo Leads

Connector type	PULSE	PLUS	MINUS
Simprop Electronic	black	red	blue
Graupner	orange	red	brown
Hitec	yellow	red	black
Futaba	white	red	black
Multiplex	yellow	red	black

11. What to do, when ...

Problem	Ursache	Lösung
Receiver doesn't work	Wrong channel stored	Scan in channel again, see section "Frequency Setting"
Servos jitter	Transmitter transmits in PCM	Switch the transmitter over to PPM
When scanning, the receiver does not find the channel	Another transmitter is closer to the receiver	Extend the aerial, place transmitter and receiver 10m away from other transmitters and repeat the scan
Range insufficient	=>	See section "Building into the Model" See section "Aerial"
Faults	=>	See section "Building into the Model" See section "Aerial" Carry out range test, compare with range of another model
Channel 7 doesn't work	Receiver works in 6-channel operation	Scan in the frequency again and switch over to 7-channel operation See section "Frequency Setting"
LED is always on	Battery discharged Receiver works in 7-channel operation	Charge LED lights up in 7-channel operation always with a low intensity
Info Terminal does not work on the "DAT" output	Receiver works in 7-channel operation	Scan in the frequency again and switch over to 6-channel operation See section "Frequency Setting"

12. Frequency Tables

The frequency tables give an overview of the frequencies which can be set (scannable). Please note that operation is only allowed at nationally approved transmission frequencies. Details of these can be obtained from the transmitter's operating instructions.

35MHz Receiver

Channel	Frequency in MHz
60	35.000
61	35.010
62	35.020
63	35.030
64	35.040
65	35.050
66	35.060
67	35.070
68	35.080
69	35.090
70	35.100
71	35.110
72	35.120
73	35.130
74	35.140
75	35.150
76	35.160
77	35.170
78	35.180
79	35.190
80	35.200

Channel	Frequency in MHz
81	35.210
82	35.220
83	35.230
84	35.240
85	35.250
86	35.260
87	35.270
88	35.280
89	35.290
90	35.300
182	35.820 B-Band
183	35.830 B-Band
184	35.840 B-Band
185	35.850 B-Band
186	35.860 B-Band
187	35.870 B-Band
188	35.880 B-Band
189	35.890 B-Band
190	35.900 B-Band
191	35.910 B-Band

40/41 MHz Receiver

Channel	Frequency in Mhz
40	40.565
41	40.575
42	40.585
43	40.595
44	40.605
45	40.615
46	40.625
47	40.635
48	40.645
49	40.655
50	40.665
51	40.675
52	40.685
53	40.695
421	40.705
54	40.715
55	40.725
56	40.735
422	40.745
423	40.755
57	40.765
58	40.775
59	40.785
424	40.795
425	40.805
81	40.815
82	40.825
83	40.835
426	40.845
427	70.855
84	40.865
85	40.875
86	40.885

Channel	Frequency in MHz
428	40.895
429	40.905
87	40.915
88	40.925
89	40.935
430	40.945
431	40.955
90	40.965
91	40.975
92	40.985
400	41.000
401	41.010
402	41.020
403	41.030
404	41.040
405	41.050
406	41.060
407	41.070
408	41.080
409	41.090
410	41.100
411	41.110
412	41.120
413	41.130
414	41.140
415	41.150
416	41.160
417	41.170
418	41.180
419	41.190
420	41.200

13. Other Matters

Manufacturer's declaration in favour of consumers

Simprop products are manufactured or sold by

Company: SIMPROP electronic
Walter Claas GmbH & Co KG
Ostheide 5, D 33428 Harsewinkel

Should this equipment acquired by a consumer and sold by SIMPROP electronic in the Federal Republic of Germany, Section 13 of the German Civil Code, (§ 13 BGB) be defective, we undertake to repair the defects in the equipment to the extent as described below. This manufacturer's declaration does not affect the claims or legal rights of the consumer in the purchase contract with the seller (dealer).

1. Extent of the Protection

This declaration is only valid when the equipment is unusable or the usability is considerably impaired (defect) as a consequence of a design, manufacturing or material fault already present in the equipment at the time of handing over to the consumer. It is not valid especially when the impairment of the equipment's usability is due to natural wear and tear, improper use (including installation) or external influences.

2. Consumer Claims Based on this Declaration

In the case of a properly lodged claim based on this declaration, SIMPROP electronic will either rectify the defect in the equipment or supply a fault-free device solely at its own discretion. The consumer cannot interpret any further claims or rights into this declaration.

3. Period of Validity

This declaration is only valid during the claim period and for claims that have been lodged with SIMPROP electronic on the basis of this declaration. The claim period is **24 months** from the date of equipment purchase by the consumer from a dealer in the Federal Republic of Germany ("date of purchase"); it ends, however, anyway 30 months at the latest after the manufacturing date of the equipment as printed on the device.

4. Lodging of Claims based on this Declaration

To establish a claim based on this declaration, the following must be sent in at the cost and risk of the consumer:

- the equipment which is the subject of the complaint
- detailed description of the defect which is the subject of the complaint
- the bill, delivery note or other suitable documents (the original in each case) as proof of date and place of purchase.

The shipment shall be made to the company address above.

6. Lapsing of Claim Period

In so far as SIMPROP electronic does not acknowledge a properly lodged claim based on this declaration within the claim period, all claims based on this declaration lapse 6 months after the time of the lodging; not, however, before the end of the claim period.

7. Applicable Law

This declaration and the claims, rights and obligations resulting therefrom are subject solely to German material law without the standards of international private law and to the exclusion of the UN purchasing law.

Please note in addition:

A detailed description of the fault can simplify enormously the search for the fault and assists in reducing the repair costs. **So, please include an extensive fault description with every repair and complaint.**

