

DDP

DECLARATION OF DESIGN AND PERFORMANCE

VHF/AM Air Band Communications Transceiver Families

FSG 90(X)	FSG 200(X)
FSG 90E(X)	FSG 200E(X)
FSG 90F(X)	FSG 200F(X)
FSG 90FE(X)	FSG 200FE(X)
FSG 90(X)-H1	FSG 200(X)-H1
FSG 90E(X)-H1	FSG 200E(X)-H1
FSG 90F(X)-H1	FSG 200F(X)-H1
FSG 90FE(X)-H1	FSG 200FE(X)-H1

118.000 ... 136.975 MHz (Normal Frequency Range)
118.000 ... 149.975 MHz (Extended Freq. Range)

8.33 kHz / 25 kHz DUAL CH Spacing
and
25 kHz ONLY SINGLE CH Spacing

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Walter Dittel GmbH Luftfahrtgerätebau
Erpftinger Strasse 36 ★ D-86899 Landsberg / Lech, Germany
Telephone +49 (0) 8191 / 3351- 0 ★ Fax +49 (0) 8191 / 3351- 49

DDP STATUS

DDP issue	Pages	Change	Issue Date
A	18	Draft (LBA)	August 04, 1997
B	19	Applicable for JTSO Authorization (LBA)	December 01, 1997
C	27	Draft, includes 10 Watt versions FSG 90 (CETECOM)	August 21, 1998
D	28	Draft, includes 10 Watt and FSG 200 (CETECOM)	November 24, 1998
E	28	Draft, FSG 90 with 10 Watt and FSG 200 (LBA)	January 11, 1999
F	28	Applicable for JTSO Authorization, 6 + 10 W, FSG 90, FSG 200 (LBA)	June 14, 1999
G	28	Page 27, Operating Instructions listing German/Engl. for 6 W and 10 W	October 27, 1999

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1.0 Foreword

This Declaration of Design and Performance (Issue D) is based on the already JTSO Authorized Transceiver Family **FSG 90** with **6 Watt** nominal RF output power level (12 models, LBA Authorization No. 10.911/98JTSO Issue 1, dated 09. January 1998).

Based on this approved transceiver Family **FSG 90**, further variants include both the **FSG 90(X)-H1** VHF/AM airband voice communications transceivers (another 12 models) with **10 Watt** nominal RF output power level.

For marketing reasons, similar 24 OEM models with different front panel writing, called **FSG 200(X)** and **FSG 200(X)-H1** are included in this DDP as well.

All **FSG 90** and **FSG 200** series transceivers consist of models with

Dual Mode: 8.33 kHz and 25 kHz Channel Spacing active

Dual Mode: 25 kHz Channel Spacing active, 8.33 kHz CH Spacing internally blocked
and with

Single Mode: 25 kHz Channel Spacing only (upgrade provision to add 8.33 kHz later).

Design, construction, manufacturing and testing is performed by the
Applicant for JTSO Authorization

WALTER DITTEL GMBH
Luftfahrtgerätebau
Erpfinger Strasse 36
D - 86899 Landsberg / Lech
Germany

1.1 Identification of the Articles

The **FSG 90(X)** and **FSG 90(X)-H1**, as well as the **FSG 200(X)** and **FSG 200(X)-H1** families VHF/AM Airband Transmitter/Receiver systems are designed for universal Aviation Analogue Voice Communications Applications

Airborne • Mobile • Fixed base • Portable

The 8.33 kHz channel spacing mode is independent of the transmitter power level models and is:

- Either included and supplied ex factory,
- Or can later be upgraded for the models with suffix "L".

The 8.33 kHz CH mode of the **FSG 90(X)**, **FSG 90(X)-H1**, **FSG 200(X)** and of the **FSG 200(X)-H1** models without suffix "L", can be disabled

- Temporarily (through SETUP), or
- Continuously (either by integral jumper positioning, or through SETUP / password),
- and continuously (the 8.33 kHz relevant components are not assembled).

All model versions are identified by the appropriate type label and Article Number.

Each of the four (4) groups **FSG 90 X**, **FSG 90(X)-H1**, **FSG 200(X)** and **FSG 200(X)-H1** series, include twelve (12) models.

- All 12 models **FSG 90(X)**, 12 models **FSG 90(X)-H1**, 12 models **FSG 200(X)** and 12 models **FSG 200(X)-H1** use identical basic technology.

- 4 models **FSG 90(X)**, 4 Models **FSG 90(X)-H1**, 4 models **FSG 200(X)** plus 4 Models **FSG 200(X)-H1**, each with suffix “L”, use again similar technology, but 25 kHz channel spacing only, because the 8.33 kHz components are not assembled.

However, the “L” models can later be upgraded through authorized facilities, using approved upgrade kits, manufacturing and test procedures, and re-labeling.

- Two different cases, with round and rectangular front panel/chassis. Basic functions of all 48 models are identical:
 - a) **6 models FSG 90(X)** with **6 Watts**, and
6 models FSG 90(X)-H1 with **10 Watts** use the 57 mm Ø round front panel
 - b) **6 models FSG 200(X)** with **6 Watts**, and
6 models FSG 200(X)-H1 with **10 Watts** use the 57 mm Ø round front panel
 - c) **6 models FSG 90F(X)** with **6 Watts**, and
6 models FSG 90F(X)-H1 with **10 Watts** use the rectangular front panel
 - d) **6 models FSG 200F(X)** with **6 Watts**, and
6 models FSG 200F(X)-H1 with **10 Watts** use the rectangular front panel
- Two different frequency ranges are employed both in the 6 W and 10 W models:
 - a) **118.000 - 136.975 MHz**, standard frequency range, 760 CH or 2,278 CH.
 - b) **118.000 - 149.975 MHz** extended Frequency range, for government authorized use only, 1,280 CH or 3,838 CH. These models are identified by suffix “E”.
- All 24 models of the **FSG 90** and all 24 models of the **FSG 200** system variants operate with 25 kHz channel spacing. The 25 kHz standard CH mode can be not disabled.
- On all **6 Watt** and **10 Watt** models without “L”, an internal jumper determines, whether the additional 8.33 kHz channel spacing functions are available to the user, or continuously blocked (type label identified). However, if 8.33 kHz CH spacing is enabled, this can be temporarily disabled or activated by the user through the front panel accessible SETUP (if not password protected for ground use).
- Change of the 8.33 kHz CH spacing continuous availability status
 - a) Any change of jumper positioning to enable or block continuously the availability of the built-in 8.33 kHz CH spacing mode must be accompanied by replacing the appropriate type label and functional control measurements
 - b) Only the manufacturer or authorized service facility can perform continuous status change.
 - c) The additional 8.33 kHz CH spacing mode is usually continuously enabled (standard). This is independent of the normal or extended frequency range.
 - d) The 8.33 kHz CH spacing mode can be continuously blocked. This is determined by positioning of an integral jumper, and its associated type label.
 - e) The normal frequency range (118-136.975 MHz), and extended frequency range (118-149.975 MHz) are determined by microprocessor firmware only, and specific alignment. The user has no access to this firmware.
- For ground applications only, annual re-calibration to maintain $\leq \pm 1$ ppm / $\leq \pm 1.5$ ppm frequency accuracy over the specified temperature range is required only, when using 8.33 kHz channel spacing.
- For 8.33 kHz airborne applications, re-calibration of the $\leq \pm 5$ ppm frequency accuracy over the specified temperature range is required only every 36 months.

- For 25 kHz airborne applications, no frequency accuracy re-calibration over the specified temperature range is required.

1.1.1 **FSG 90(X), 6 Watt, Dual Mode 8.33 kHz / 25 kHz, Model Identification**

Variant Article No. FSG 90 (6 Watt) models with 8.33 kHz and / or only 25 kHz CH spacing

1	F10185	Dual Mode VHF/AM airband transceiver FSG 90 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 CH <u>and</u> 118.005 - 136.980 channels with 8.33 kHz channel spacing / 2,278 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> . IDENT.: MODEL 90-25/8.33 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
2	F10191	VHF/AM airband transceiver FSG 90 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 channels, 99 memory channels with 25 kHz CH spacing, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> , 8.33 kHz functions <u>internally disabled</u> . IDENT.: MODEL 90-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
3	F10192	Dual Mode VHF/AM airband transceiver FSG 90E 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, <u>and</u> 118.005 - 149.980 channels with 8.33 kHz channel spacing / 3,838 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> . IDENT.: MODEL 90E-25/8.33 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
4	F10193	VHF/AM airband transceiver FSG 90E 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels with 25 kHz channel spacing only, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> , 8.33 kHz functions internally disabled. IDENT.: MODEL 90E-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
5	F10194	Dual Mode VHF/AM airband transceiver FSG 90F 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 CH, <u>and</u> 118.005 - 136.980 channels with 8.33 kHz channel spacing / 2,278 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. IDENT.: MODEL 90F-25/8.33 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
6	F10195	VHF/AM airband transceiver FSG 90F 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 channels, 99 memory channels with 25 kHz channel spacing only, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener, 8.33 kHz functions internally disabled. IDENT.: MODEL 90F-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
7	F10196	Dual Mode VHF/AM airband transceiver FSG 90FE 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 CH, <u>and</u> 118.005 - 149.980 channels with 8.33 kHz channel spacing, 3,838 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. IDENT.: MODEL 90FE-25/8.33 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
8	F10197	VHF/AM airband transceiver FSG 90FE 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels with 25 kHz channel spacing only, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener, 8.33 kHz functions internally disabled. IDENT.: MODEL 90FE-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER

1.1.2 FSG 90(X), 6 Watt Models, 25 kHz Spacing only (8.33 kHz CH Upgrade Provision)**Variant Article No. FSG 90 system models with 25 kHz CH spacing only**

- | | | |
|----|--------|---|
| 9 | F10208 | VHF/AM airband transceiver FSG 90L
118.000 - 136.975 MHz with 25 kHz channel spacing only / 760 channels, 99 memory channels, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> . Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 90L-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |
| 10 | F10209 | VHF/AM airband transceiver FSG 90EL
118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> . Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 90EL-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |
| 11 | F10210 | VHF/AM airband transceiver FSG 90FL
118.000 - 136.975 MHz with 25 kHz channel spacing only / 760 channels, 99 memory channels, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 90FL-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |
| 12 | F10211 | VHF/AM airband transceiver FSG 90FEL
118.000 - 149.975 MHz with 25 kHz channel spacing only / 1,280 channels, 99 memory channels, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 90FEL-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |

NOTE 1 The frequency / channel name displayed on the **FSG 90(X)** transceiver family front panel corresponds with international **ICAO**, **EUROCAE**, **RTCA**, German National **BAPT** and **DFS** requirements for both the 25 kHz and 8.33 kHz channel spacing display scheme.

NOTE 2 Operation of **FSG 90E**, **FSG 90EL**, **FSG 90 FE** and **FSG 90FEL** with extended frequency band coverage is allowed for authorized users only.

NOTE 3 Depending on National Regulations, an *individual* National Operating License may be required for (any) radio equipment. This Individual Operating License is usually granted by the responsible National Telecommunications Authority.

1.1.3 FSG 90(X)-H1, 10 Watt, Dual Mode 8.33 kHz / 25 kHz, Model Identification**Variant Article No. FSG 90(X)-H1 system models with 8.33 kHz and 25 kHz CH spacing**

13	F10302	Dual Mode VHF/AM airband transceiver FSG 90-H1 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 CH and 118.005 - 136.980 channels with 8.33 kHz channel spacing / 2,278 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> . IDENT.: MODEL 90-25/8.33-H1 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
14	F10303	VHF/AM airband transceiver FSG 90-H1 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 channels, 99 memory channels with 25 kHz CH spacing, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> , 8.33 kHz functions <u>internally disabled</u> . IDENT.: MODEL 90-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
15	F10304	Dual Mode VHF/AM airband transceiver FSG 90E-H1 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, and 118.005 - 149.980 channels with 8.33 kHz channel spacing / 3,838 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> . IDENT.: MODEL 90E-25/8.33-H1 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
16	F10305	VHF/AM airband transceiver FSG 90E-H1 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels with 25 kHz channel spacing only, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> , 8.33 kHz functions internally disabled. IDENT.: MODEL 90E-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
17	F10306	Dual Mode VHF/AM airband transceiver FSG 90F-H1 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 CH, and 118.005 - 136.980 channels with 8.33 kHz channel spacing / 2,278 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. IDENT.: MODEL 90F-25/8.33-H1 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
18	F10307	VHF/AM airband transceiver FSG 90F-H1 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 channels, 99 memory channels with 25 kHz channel spacing only, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener, 8.33 kHz functions internally disabled. IDENT.: MODEL 90F-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
19	F10308	Dual Mode VHF/AM airband transceiver FSG 90FE-H1 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 CH, and 118.005 - 149.980 channels with 8.33 kHz channel spacing, 3,838 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. IDENT.: MODEL 90FE-25/8.33-H1 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
20	F10309	VHF/AM airband transceiver FSG 90FE-H1 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels with 25 kHz channel spacing only, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener, 8.33 kHz functions internally disabled. IDENT.: MODEL 90FE-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER

1.1.4 FSG 90-H1, 10 Watt Models, 25 kHz only (8.33 kHz Spacing Upgrade Provision)**Variant Article No. FSG 90-H1 system models with 25 kHz CH spacing only**

21	F10310	VHF/AM airband transceiver FSG 90L-H1 118.000 - 136.975 MHz with 25 kHz channel spacing only / 760 channels, 99 memory channels, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> . Provision for later upgrade to add 8.33 kHz CH spacing included. IDENT.: MODEL 90L-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
22	F10311	VHF/AM airband transceiver FSG 90EL-H1 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> . Provision for later upgrade to add 8.33 kHz CH spacing included. IDENT.: MODEL 90EL-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
23	F10312	VHF/AM airband transceiver FSG 90FL-H1 118.000 - 136.975 MHz with 25 kHz channel spacing only / 760 channels, 99 memory channels, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. Provision for later upgrade to add 8.33 kHz CH spacing included. IDENT.: MODEL 90FL-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
24	F10313	VHF/AM airband transceiver FSG 90FEL-H1 118.000 - 149.975 MHz with 25 kHz channel spacing only / 1,280 channels, 99 memory channels, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. Provision for later upgrade to add 8.33 kHz CH spacing included. IDENT.: MODEL 90FEL-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER

NOTE 1 The frequency / channel name displayed on the **FSG 90(X)-H1** transceiver family front panel corresponds with international **ICAO, EURO-CAE, RTCA**, German National **Reg TP** and **DFS** requirements for both the 25 kHz and 8.33 kHz channel spacing display scheme.

NOTE 2 Operation of **FSG 90E-H1, FSG 90EL-H1, FSG 90 FE-H1** and **FSG 90FEL-H1** with extended frequency band coverage is allowed for authorized users only.

NOTE 3 Depending on National Regulations, an **individual** National Operating License may be required for (any) radio equipment. This Individual Operating License is usually granted by the responsible National Telecommunications Authority.

1.1.5 FSG 200(X), 6 Watt, Dual Mode 8.33 kHz / 25 kHz, Model Identification**Variant Article No. FSG 200 (6 Watt) models with 8.33 kHz and/or only 25 kHz CH spacing**

25	F10321	Dual Mode VHF/AM airband transceiver FSG 200 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 CH and 118.005 - 136.980 channels with 8.33 kHz channel spacing / 2,278 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> . IDENT.: MODEL 200-25/8.33 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
26	F10322	VHF/AM airband transceiver FSG 200 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 channels, 99 memory channels with 25 kHz CH spacing, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> , 8.33 kHz functions <u>internally disabled</u> . IDENT.: MODEL 200-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
27	F10323	Dual Mode VHF/AM airband transceiver FSG 200E 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, and 118.005 - 149.980 channels with 8.33 kHz channel spacing / 3,838 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> . IDENT.: MODEL 200E-25/8.33 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
28	F10324	VHF/AM airband transceiver FSG 200E 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels with 25 kHz channel spacing only, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> , 8.33 kHz functions internally disabled. IDENT.: MODEL 200E-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
29	F10325	Dual Mode VHF/AM airband transceiver FSG 200F 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 CH, and 118.005 - 136.980 channels with 8.33 kHz channel spacing / 2,278 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. IDENT.: MODEL 200F-25/8.33 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
30	F10326	VHF/AM airband transceiver FSG 200F 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 channels, 99 memory channels with 25 kHz channel spacing only, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener, 8.33 kHz functions internally disabled. IDENT.: MODEL 200F-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
31	F10327	Dual Mode VHF/AM airband transceiver FSG 200FE 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 CH, and 118.005 - 149.980 channels with 8.33 kHz channel spacing, 3,838 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. IDENT.: MODEL 200FE-25/8.33 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
32	F10328	VHF/AM airband transceiver FSG 200FE 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels with 25 kHz channel spacing only, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener, 8.33 kHz functions internally disabled. IDENT.: MODEL 200FE-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER

1.1.6 FSG 200(X), 6 Watt Models, 25 kHz Spacing only (8.33 kHz CH Upgrade Provision)**Variant Article No. FSG 200 system models with 25 kHz CH spacing only**

- | | | |
|----|--------|---|
| 33 | F10329 | VHF/AM airband transceiver FSG 200L
118.000 - 136.975 MHz with 25 kHz channel spacing only / 760 channels, 99 memory channels, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> . Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 200L-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |
| 34 | F10330 | VHF/AM airband transceiver FSG 200EL
118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels, 6 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"φ <u>round front panel</u> . Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 200EL-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |
| 35 | F10331 | VHF/AM airband transceiver FSG 200FL
118.000 - 136.975 MHz with 25 kHz channel spacing only / 760 channels, 99 memory channels, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 200FL-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |
| 36 | F10332 | VHF/AM airband transceiver FSG 200FEL
118.000 - 149.975 MHz with 25 kHz channel spacing only / 1,280 channels, 99 memory channels, 6 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 200FEL-25/000 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |

NOTE 1 The frequency / channel name displayed on the **FSG 200(X)** transceiver family front panel corresponds with international **ICAO**, **EURO-CAE**, **RTCA**, German National **BAPT** and **DFS** requirements for both the 25 kHz and 8.33 kHz channel spacing display scheme.

NOTE 2 Operation of **FSG 200E**, **FSG 200EL**, **FSG 200 FE** and **FSG 200FEL** with extended frequency band coverage is allowed for authorized users only.

NOTE 3 Depending on National Regulations, an ***individual*** National Operating License may be required for (any) radio equipment. This Individual Operating License is usually granted by the responsible National Telecommunications Authority.

1.1.7 FSG 200(X)-H1, 10 Watt, Dual Mode 8.33 kHz / 25 kHz, Model Identification**Variant Article No. FSG 200(X)-H1 system models with 8.33 kHz and 25 kHz CH spacing**

37	F10333	Dual Mode VHF/AM airband transceiver FSG 200-H1 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 CH and 118.005 - 136.980 channels with 8.33 kHz channel spacing / 2,278 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> . IDENT.: MODEL 200-25/8.33-H1 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
38	F10334	VHF/AM airband transceiver FSG 200-H1 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 channels, 99 memory channels with 25 kHz CH spacing, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> , 8.33 kHz functions <u>internally disabled</u> . IDENT.: MODEL 200-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
39	F10335	Dual Mode VHF/AM airband transceiver FSG 200E-H1 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, and 118.005 - 149.980 channels with 8.33 kHz channel spacing / 3,838 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> . IDENT.: MODEL 200E-25/8.33-H1 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
40	F10336	VHF/AM airband transceiver FSG 200E-H1 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels with 25 kHz channel spacing only, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> , 8.33 kHz functions internally disabled. IDENT.: MODEL 200E-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
41	F10337	Dual Mode VHF/AM airband transceiver FSG 200F-H1 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 CH, and 118.005 - 136.980 channels with 8.33 kHz channel spacing / 2,278 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. IDENT.: MODEL 200F-25/8.33-H1 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
42	F10338	VHF/AM airband transceiver FSG 200F-H1 118.000 - 136.975 MHz with 25 kHz channel spacing / 760 channels, 99 memory channels with 25 kHz channel spacing only, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener, 8.33 kHz functions internally disabled. IDENT.: MODEL 200F-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER
43	F10339	Dual Mode VHF/AM airband transceiver FSG 200FE-H1 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 CH, and 118.005 - 149.980 channels with 8.33 kHz channel spacing, 3,838 channels. 99 Dual Mode 8.33 / 25 kHz memory channels, additional 99 memory channels with 25 kHz mode only, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. IDENT.: MODEL 200FE-25/8.33-H1 · ED-23B CLASS C / CLASS E RECEIVER, CLASS 4 / CLASS 6 TRANSMITTER
44	F10340	VHF/AM airband transceiver FSG 200FE-H1 118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels with 25 kHz channel spacing only, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener, 8.33 kHz functions internally disabled. IDENT.: MODEL 200FE-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER

1.1.8 FSG 200-H1, 10 Watt Models, 25 kHz only (8.33 kHz Spacing Upgrade Provision)**Variant Article No. FSG 200-H1 system models with 25 kHz CH spacing only**

- | | | |
|----|--------|--|
| 45 | F10341 | VHF/AM airband transceiver FSG 200L-H1
118.000 - 136.975 MHz with 25 kHz channel spacing only / 760 channels, 99 memory channels, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> . Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 200L-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |
| 46 | F10342 | VHF/AM airband transceiver FSG 200EL-H1
118.000 - 149.975 MHz with 25 kHz channel spacing / 1,280 channels, 99 memory channels, 10 Watt RF power output, 10 - 16.5 Vdc supply, 57 mm / 2 ¼"Ø <u>round front panel</u> . Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 200EL-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |
| 47 | F10343 | VHF/AM airband transceiver FSG 200FL-H1
118.000 - 136.975 MHz with 25 kHz channel spacing only / 760 channels, 99 memory channels, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 200FL-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |
| 48 | F10344 | VHF/AM airband transceiver FSG 200FEL-H1
118.000 - 149.975 MHz with 25 kHz channel spacing only / 1,280 channels, 99 memory channels, 10 Watt RF power output, 10 - 16.5 Vdc supply, <u>rectangular front panel</u> , DZUS fastener. Provision for later upgrade to add 8.33 kHz CH spacing included.

IDENT.: MODEL 200FEL-25/000-H1 · ED-23B CLASS C RECEIVER, CLASS 4 TRANSMITTER |

NOTE 1 The frequency / channel name displayed on the **FSG 200(X)-H1** transceiver family front panel corresponds with international **ICAO, EURO-CAE, RTCA**, German National **Reg TP** and **DFS** requirements for both the 25 kHz and 8.33 kHz channel spacing display scheme.

NOTE 2 Operation of **FSG 200E-H1, FSG 200EL-H1, FSG 200 FE-H1** and **FSG 200FEL-H1** with extended frequency band coverage is allowed for authorized users only.

NOTE 3 Depending on National Regulations, an **individual** National Operating License may be required for (any) radio equipment. This Individual Operating License is usually granted by the responsible National Telecommunications Authority.

2.0 Design description

All 48 transceiver models comply with ICAO ANNEX 10 (receiver intermodulation immunity against interference from FM broadcast signals).

The **FSG 90(X) family** includes **12 VHF/AM transceiver models**.

The **FSG 90(X)-H1 family** includes another **12 VHF/AM transceiver models**, which are similar but feature higher (10 Watts) transmitter RF power output.

The **FSG 200(X) family** includes **12 VHF/AM transceiver models**.

The **FSG 200(X)-H1 family** includes another **12 VHF/AM transceiver models**, which are similar but feature higher (10 Watts) transmitter RF power output.

The twelve **FSG 90(X)** and twelve **FSG 90(X)-H1** transceiver models operate from nominal 14 V dc power source (10 Vdc to 16.5 Volts continuous dc supply). Operation from 28 V dc source requires suitable external 28 Vdc / 14 Vdc voltage regulator unit.

The twelve **FSG 200(X)** and twelve **FSG 200(X)-H1** transceiver models operate from nominal 14 V dc power source (10 Vdc to 16.5 Volts continuous dc supply). Operation from 28 V dc source requires suitable external 28 Vdc / 14 Vdc voltage regulator unit.

Common characteristics

At 25 kHz channel spacing, all **FSG 90** and **FSG 200** series transceivers are fully compatible with 25 kHz Climax Offset Frequency channel operation requirements.

Continuous transmit time-out is indicated by blinking of the actual LC display content.

Continuous 1-minute Transmit / 4-minute Receive duty cycle operation is ensured.

During transmit, a symbol in the LC display indicates the transmit mode.

Below approx. 9 V dc supply, the **FSG 90** and **FSG 200** series switches itself OFF automatically, to avoid unstable functions, or e.g. deep discharge of the supply battery while being stored and switched ON continuously.

When sufficient (more than 10 Vdc) supply exists, operation capability is restored. Operation can be continued on the settings used before.

During operation, continuous display of the dc supply voltage level is provided by a 3-bar indicator. Below 11 V dc supply, emergency operation is indicated by blinking of the dc supply 3-bar level indicator.

In order to avoid blocked channels e.g. due to stuck PTT button, the **maximum continuous transmitter operating time is limited to two minutes** by the built-in transmit time-out-timer control. Such channel blocking prevention due to transmit time-out is an operational feature only and not mandatory requirement of equipment design limits.

Simultaneous transmission blocking during reception on the channel in use is another feature. Transmission is avoided through the **built-in transmit blocking** feature (which is normally activated in the SETUP).

This Transmit Blocking function corresponds / interacts with the Squelch (SQ) ON/OFF status.

When "bloc" = "1"/ON is selected in the SETUP, transmission blocking during ongoing reception is controlled by the Receiver Squelch threshold.

This should be the Normal Transmitter Blocking Status:

- a) SQ = ON = Blocking is ON. Receiver noise without received signal is muted (normal operation), transmission during receive is disabled / avoided.

- b) If receiver noise without received signal is audible (temporary operation), then activated TX blocking is overridden / disabled. Instantaneous Transmit is ensured.
- c) When the Squelch is closed again, TX blocking becomes again activated.
- d) If required, the transmit blocking feature can be continuously disabled in the SETUP by setting "bloc" to "0").

The **FSG 90(X), FSG 90(X)-H1, FSG 200(X)** and **FSG 200(X)-H1** design is completely solid-state. R.F. signals being developed by a microprocessor controlled digital frequency synthesizer with phase locked loop control.

For airborne applications only, because of frequency stability $< \pm 5$ ppm required for 8.33 kHz CH spacing, the **FSG 90(X), FSG 90(X)-H1, FSG 200(X)** and **FSG 200(X)-H1** frequency stability re-calibration is required every 36 months.

For ground based 8.33 kHz CH spacing operation only, annual re-calibration of the **FSG 90(X), FSG 90(X)-H1, FSG 200(X)** and **FSG 200(X)-H1** reference oscillator is required (frequency stability better than ± 1.5 ppm from -20°C ... $+55^{\circ}\text{C}$).

On the other hand, the 25 kHz frequency stability characteristics of all 48 models even benefit from the excellent frequency stability design in 8.33 kHz mode, whether 8.33 kHz channel spacing may be included (enabled or disabled), or not included. Therefore, no periodic frequency stability re-calibration is required for 25 kHz operation.

2.1 Three Operating Modes are Standard

A repeated push on the MD button (MD = Mode) at the front panel steps through consecutive selection of any one of the three operating modes.

- 1) Frequency only Mode
Only the selected frequency (or channel name) is displayed and active.
- 2) Channel / Frequency Mode
Up to 99 memory channels may be stored by user's discretion in each (single or dual) channel mode into non volatile memory.

Preset channel deletion is only controlled possible (through the SETUP mode).

Change / reprogramming of any of the 99 Memory Channels is possible in each memory set in all three Modes (CH only, Transfer Active/Standby, CH/Frequency).

Two different memory sets are available:

- 1) 8.33 kHz and 25 kHz CH Dual Mode CH spacing, **99 CH with 6-digit display**, and in addition / or
- 2) 25 kHz mode only (another / additional set of 99 CH), if
 - a) The 25 kHz-only mode is selected, **99 CH with 5-digit display**, and / or
 - b) 8.33 kHz CH spacing is disabled or not available

In both of these independent memory sets, the individual CH 1 to CH 4 are always preset out of these two CH memory sets. Any frequency which is stored on CH 1 to CH 4 can be not deleted, but newly programmed (if this is for ground use not blocked in the SETUP). The memory content of any of the additional max. 95 separately preset CH 5 to CH 99 may be programmed and deleted individually.

Access to the two preset CH modes corresponds with active display mode.

If the free frequency selection mode is disabled in SETUP, operation is limited to preset channels only, e.g. for airport vehicles. Access to change this channel-only operation is provided through the SETUP, even password protected, if required.

3) Active / Standby frequency mode

Allows standby frequency presetting and quick transfer from Standby to Active.

When TRANSFER (↓) is pressed in both the Channel / Frequency mode, or in the Frequency-Only mode, instant change to this Active / Standby frequency mode is executed.

2.2 Further characteristics

- Individual Modulation sensitivity and Intercom performance adjustment. The microphone level requirement / Headset characteristics can be matched through SETUP adjustment and indication for best modulation audio quality with minimized background noise content. This corresponds with optimized Intercom audio quality.
- High level phone A.F. output (100 mW / 600 Ohms) from a separate headphone audio amplifier. This (automatically leveled) audio output is available in all operating modes (intercom, AF-external input, receive audio and transmit sidetone).
- High Loudspeaker A.F. output (8 W / 2 Ω or 4 W / 4 Ω).
- Separate continuous TX/RX audio output (which is not SQ controlled) is available, leveled, for recording.
- Auxiliary audio frequency input allows monitoring (through speaker and / or phone) of the audio output of e.g. navigation receivers using the integral audio amplifiers.
Reduced standby current consumption can be achieved for portable, battery supplied operation, if the external audio input is not required / applicable. The receiving audio signal is then available, from speaker output only.
- Frequency display illumination can be supplied independently via the external dimmer input, or derived from switched dc output, while the unit is switched ON.
- Transmit symbol in display indicates optically, that the transmitter is activated.
During reception but with the transmit blocking function activated, no TX symbol is visible during PTT, as an optical transmit prevention indication, and no TX sidetone audio exists.
- TX time-out-timer stops transmission after 2 minutes continuous TX. With a stuck button, repeated switching ON of the transceiver allows to transmit again for another max. two minutes duration transmit sequence.
- Computer controlled automatic testing allows both enhanced service checks and specific automatic equipment calibration to meet the tough specifications (specified Test Setup and Test Software).
- Each of the two main PCB modules contains its own non volatile storage of individual calibration data and coded PCB module manufacturing information. Computer controlled test equipment, software and adapters are required for re-calibration.
- Access to individual module-specific calibration data is blocked. Thus, the incorporated microprocessor firmware protects the system from unauthorized manipulation.
- Proprietary audio signal processing circuitry ensures excellent clarity and stability IDENTICAL in both 8.33 kHz and 25 kHz channel spacing. Nearly no Audio Quality difference exists between both channel spacing modes, both in Transmit and in Receive mode.
- Over a wide range from very low to very high receiver RF input levels, communications audio quality is almost identical, until the receiver Squelch closing level

threshold is nearly reached (at radio communications distance corresponding with signal strength).

- High average depth of transmitter modulation (min. 75%, typ. 80%) over a wide range of microphone input levels.
- Audio frequency output is leveled in both receive and transmit sidetone mode.
- For bench test only (specific measurements), the Service Mode can be activated temporarily through the SETUP, resulting in:
 - a) Audio frequency leveling is disabled
 - b) Transmit time-out-timer limit is extended to 15 minutes
 - c) Transmit blocking during receive is disabled.

Normal operation (Service Mode OFF) is resumed, if the **FSG 90** or **FSG 200** system is switched OFF and ON again, or when the SETUP is finished and closed.
- The receiver Squelch uses a combined AM carrier and FM operated automatic signal weighing system which is determined by the carrier to noise ratio, with manual override (through SQ button).
- The Dual Superhet receiver uses varactor tuned RF input and varactor tuned RF notch filter front-end circuitry. This ensures the capability to receive without interference in even very high RF interference level environments. This is required especially for demanding airport ground communications, where high radio communications density (higher power transmitters in close distance) exists.
- The solid state VHF transmitter design uses broad band fixed tuned circuits.

2.3 SETUP Mode

While the aircraft is parked safely on the ground, or during bench tests, the SETUP mode allows optimized adjustment / selection of 13 different **FSG 90** or **FSG 200** system front panel accessible service settings to match operating conditions best with installation / accessory and operational characteristics:

1	<u>Squelch threshold</u> , four levels	7	<u>Individual deletion of programmed memory channels</u>
2	<u>Microphone sensitivity</u> , with display	8	<u>AF external input</u> ON / OFF (saves ≈30 mA in standby)
3	<u>Transmit Sidetone</u> , audio volume	9	<u>Blocking of free frequency selection / CH programming</u>
4	<u>Intercom</u> , audio volume	10	<u>Transmit blocking during receive mode</u> ON / OFF
5	<u>Phone audio level</u> , different to speaker	11	<u>Service mode</u> ON (temporarily for bench testing)
6	<u>8.33 kHz channel spacing</u> ON / OFF	12	<u>Option module function</u> ON / OFF (not activated yet)
		13	<u>Password</u> , any No. 00000 to 99999 (specific override)

2.4 Mechanical description

The **FSG 90** and **FSG 200** series transceivers are enclosed in robust metal case. All parts are protected against corrosion. The transceiver front panel is sealed against dust and water drops. Connection to accessories and test equipment is made through a filtered integral 25 pole accessory D-type plug, and a BNC antenna connector.

Mechanical installation and electrical interconnection details of the twelve **FSG 90(X)** as well as of the twelve **FSG 90(X)-H1**, and of the twelve **FSG 200(X)** as well as of the twelve **FSG 200(X)-H1** VHF/AM transceiver models each are identical.

For all models with extended frequency range (suffix “E” models), the antenna frequency range 118 to 150 MHz must be matched.

Shock mounts are not required due to robust construction (15 G operational shocks).

Although significantly different airborne and ground based certification requirements exist, the equipment design meets all of these requirements, making it universally applicable both in airborne and in ground based installations.

Environmental operating conditions requirements are met for airborne use in turbine and piston, single and twin engine powered fixed wing aircraft and helicopters, and (also battery supplied) in aircraft like Balloons, Gliders, and in Ultralight aircraft, in portable carrying cases, in vehicle installations and in many other (fixed) ground based installations.

Together with optional slide-in mounting (airborne) rack adaptation kits, the antenna socket positioning on the rear of the **FSG 90(X), FSG 90(X)-H1, FSG 200(X) and FSG 200(X)-H1** with round front panel chassis series may be relocated to fit into suitable interface adapters to achieve exchangeability while maintaining miniaturized system dimensions.

All transceivers feature small dimensions, low weight, wide supply voltage range and low power consumption, and are direct front panel operated.

All 24 models with suffix “F” feature rectangular front and chassis shape, using DZUS mounting.

All 24 models without suffix “F” feature 2 ¼ “Ø round front and chassis shape.

Each of the two main P.C. boards (TX/RX RF board and AF board) uses one half of the front-to-front positioned, robust metal chassis.

The separate (main) Type Label contains JTSO Categories, Serial Number, voltage, weight and further Approval identifications, and is placed on the AF P.C. board outer chassis side

An additional type identification label / model designation label is also placed on the AF P.C. board outer chassis side. This label also includes information to the 8.33 kHz CH selection / availability status.

The control head chassis contains the microprocessor P.C. board including firmware, and the display P.C. control board. It also holds the front sides of the two main chassis parts together.

All P.C. boards use SMT (Surface Mount Technology) components. The boards are electrically interfaced by plug-in connectors and flat cables for easy servicing.

All P.C. boards are completely pre-aligned and individually calibrated over the full operating temperature range. Individual calibration data are stored in non volatile, separate memory onto each board. Therefore, realignment is not required after P.C. board replacement, except few simple level adjustments.

Critical RF stages are enclosed in individual shields. The massive aluminum chassis is also used to dissipate the heat generated in the major power handling components.

3.0 Test Standards

Airborne design requirements meet the updated JTSO-2C37e and JTSO-2C38e:

- EUROCAE ED-23B (Minimum Operational Performance Standard), and
- EUROCAE ED-14C / RTCA DO-160C environmental conditions and test procedures, Categories D1-AA(BMN)XXXXXXZBBBATZXXXX.
- Reg TP “EG Baumusterbescheinigung” for universal airborne and ground based operation No. A132937J, A132947J for the 6 watt versions, which is extended to include OEM models FSG 200, and also all of the –H1 variants with 10 Watts.
- DFS type approval for ground operation (No. B-7850/97 and B-7851/97, 6 Watts FSG 90(X). FSG 200 and 10 Watts DFS approval extension is in progress.

3.1 Software / Firmware

EUROCAE ED-12B / RTCA DO-178B (Software) requirements Level “D” are fulfilled.

Proprietary firmware (integral software) accessibility to test, adjust / calibrate the **FSG 90** and the **FSG 200** system functions belongs to the manufacturer and is usable only during authorized and proprietary production alignment and testing. Both automatic functional testing and automatic calibration can be performed by using suitable, approved test equipment, test setup and applicable test software, by approved test facilities only.

4.0 Record of Drawings

The listing „Geräteunterlagen **FSG 90(X), FSG 90(X)-H1, FSG 200(X)** and **FSG 200(X)-H1**“ includes the „Inhaltsverzeichnis (Content)“.

Manufacturing documentation includes detailed Part number, Parts quantity, Parts value and positioning, drawings and test details, and quality assurance measures.

The Drawing Identification Code consists of the following:

<u>Identifier</u>	<u>Content</u> (English)	<u>Inhalt</u> (German / Deutsch)
IV	Table of content	<u>I</u> nhalts <u>v</u> erzeichnis
SP	Circuit diagram	<u>S</u> tromlauf <u>p</u> lan
MB	Drawing with dimensions	<u>M</u> aß <u>b</u> ild
ZZ	Overview drawing	<u>Z</u> usammenstell- <u>Z</u> eichnung
EZ	Parts drawing	<u>E</u> inzelteil- <u>Z</u> eichnung
ST	Parts list	<u>S</u> tückliste
LZ	Painting drawing	<u>L</u> ackier <u>z</u> eichnung
PA	Test instructions	<u>P</u> rüf <u>a</u> nweisung
BP	Parts location drawing	<u>B</u> estückungs <u>p</u> lan
PI	Printed circuit board information	<u>P</u> latinen <u>i</u> nformation
BV	Manufacturing instruction	<u>B</u> au <u>v</u> orschrift

The column “Inhalt” describes the German translated identification of the abbreviations used for the documents concerned.

5.0 Environmental Performance Classification

Compliance measurements for all 24 transceiver models **FSG 90** and for all 24 transceiver models **FSG 200** listed in the revised **QTR 031.00** (updated) Qualification Test Report are based on following MOPS (Minimum Operational Performance Specifications):

- EUROCAE ED-23B, dated March 1995

Class 4 Transmitter, 100 NM range, 25 kHz channel spacing

Class 6 Transmitter, 100 NM range, 8.33 kHz channel spacing

Class C Receiver, 25 kHz channel spacing, for offset carrier operation

Class E Receiver, 8.33 kHz channel spacing, NOT for offset carrier use

- EUROCAE ENVIRONMENTAL STANDARD ED-14C / DO 160C, dated 12-12-89

<u>Conditions</u>	<u>Section</u>	<u>Conducted Tests Description</u>	<u>Category</u>
Temperature and Altitude	4.0	Equipment tested to Category	D1
Low Temperature	4.5.1	Operation - 20°C / Storage -55°C	
High Temperature	4.5.2	Operation +55°C / Storage +85°C	
In-Flight Loss of Cooling	4.5.3	No auxiliary cooling required	-
Altitude	4.6.1	50,000 ft / 15,240 m	
Decompression	4.6.2	No test required in Category D1	
Over Pressure	4.6.3	No test required in Category D1	
Temperature Variation	5.0	Equipment tested to Category	A
Humidity	6.0	Equipment tested to Category	A
Shock	7.0 7.2 7.3	Equipment tested to Operational shocks 6G Crash Safety 15G	
Vibration	8.0	Equipment tested to Category	BMN
Explosion	9.0	No test required	X
Waterproofness	10.0	No test required	X
Fluids Susceptibility	11.0	No test required	X
Sand and Dust	12.0	No test required	X
Fungus	13.0	No test required	X
Salt Spray	14.0	No test required	X
Magnetic Effect	15.0	Equipment tested to Category	Z
Power Input	16.0	Equipment tested to Category	B
Voltage Spike	17.0	Equipment tested to Category	B
Audio Frequency Susceptibility	18.0	Equipment tested to Category	B
Induced Signal Susceptibility	19.0	Equipment tested to Category	A
Radio Frequency Susceptibility	20.0	Equipment tested to Category	T
Radio Frequency Emission	21.0	Equipment tested to Category	Z
Lightning Induced Susceptibility	22.0	No test required	X
Lightning Effects	23.0	No test required	X
Icing	24.0	No test required	X
Other Test	----	No test required	X

6.0 Technical Characteristics

6.1 General

6.1.1 48 Model Variants (with applicable Part Number)

Front	Freq. Range	CH Space	CH	6 Watt (Dittel)	10 W (Dittel)	6 W (OEM)	10 W (OEM)
Round 2 ¼" Ø	118.000-136.975	8.33 kHz 25 kHz	2,278 760	FSG 90 F10185	FSG 90-H1 F10302	FSG 200 F10321	FSG 200-H1 F10333
Round 2 ¼" Ø	118.000-136.975	25 kHz	760	FSG 90 F10191	FSG 90-H1 F10303	FSG 200 F10322	FSG 200-H1 F10334
Round 2 ¼" Ø	118.000-149.975	8.33 kHz 25 kHz	3,838 1,280	FSG 90E F10192	FSG 90E-H1 F10304	FSG 200E F10323	FSG 200E-H1 F10335
Round 2 ¼" Ø	118.000-149.975	25 kHz	1,280	FSG 90E F10193	FSG 90E-H1 F10305	FSG 200E F10324	FSG 200E-H1 F10336
Rectangular	118.000-136.975	8.33 kHz 25 kHz	2,278 760	FSG 90F F10194	FSG 90F-H1 F10306	FSG 200F F10325	FSG 200F-H1 F10337
Rectangular	118.000-136.975	25 kHz	760	FSG 90F F10195	FSG 90F-H1 F10307	FSG 200F F10326	FSG 200F-H1 F10338
Rectangular	118.000-149.975	8.33 kHz 25 kHz	3,838 1,280	FSG 90FE F10196	FSG 90FE-H1 F10308	FSG 200FE F10327	FSG 200FE-H1 F10339
Rectangular	118.000-149.975	25 kHz	1,280	FSG 90FE F10197	FSG 90FE-H1 F10309	FSG 200FE F10328	FSG 200FE-H1 F10340
Round 2 ¼" Ø	118.000-136.975	25 kHz only	760	FSG 90L F10208	FSG 90L-H1 F10310	FSG 200L F10329	FSG 200L-H1 F10341
Round 2 ¼" Ø	118.000-149.975	25 kHz only	1,280	FSG 90EL F10209	FSG 90EL-H1 F10311	FSG 200EL F10330	FSG 200EL-H1 F10342
Rectangular	118.000-136.975	25 kHz only	760	FSG 90FL F10210	FSG 90FL-H1 F10312	FSG 200FL F10331	FSG 200FL-H1 F10343
Rectangular	118.000-149.975	25 kHz only	1,280	FSG 90FEL F10211	FSG 90FEL-H1 F10313	FSG 200FEL F10332	FSG 200FEL-H1 F10344

6.1.2 Memory Channels

Memory Channels, models with suffix (L)	99 memory channels (25 kHz CH spacing only, 5-digit displayed)
Not erasable Channels	Channels 1 to 4 in all FSG 90 and FSG 200 series and in all Modes remain always stored and can be user defined reprogrammed, but not deleted
Memory Channel Availability	All 99 + 99 memory channels remain stored in non volatile memory, also when the unit is being switched OFF

6.1.3 Power Supply, Fuses

Nominal Supply Voltage	6 Watt models: 13.75 Vdc, 10 Watt models: 14.00 Vdc
Supply Voltage Range	11.0 - 16.5 Vdc
Emergency Operation (below 11 Vdc)	Good communication above 10 Vdc, any voltage 10 - 16.5 Vdc
Automatic Turn-Off	Approx. 8.5 ... 9.5 Vdc Supply
Automatic Turn-On (reset)	Approx. 9.5 ... 10 Vdc Supply
Input Current at 13.75 Vdc: Standby (Power Saving Mode) Additionally Squelch, Intercom + AF Ext. Receive Mode (70% AM voice) Transmit Mode (carrier / 70% AM voice) Display Lighting	≤ 80 mA (no volume, no AF External, no Intercom) add 30 mA w/out AF volume, add 250 mA with max. AF volume ≤ 1 Amp (into 2 Ohm speaker) ≤ 2,5 A / ≤ 3,5 A (6 Watt), ≤ 3,5 A / ≤ 4.5 A (10 Watt) ≤ 30 mA additionally
dc Supply indicator	3 segments visible: ≥ 12.7 Vdc Battery full 2 segments visible: ≥ 12.0 Vdc Battery ca. ½ capacity 1 segment visible: ≥ 11.0 Vdc Battery nearly discharged 3 flashing segments: 11 V ... 10 Vdc Emergency operation
External Fuse	Cartridge fuse 3.15 Amp, quick acting, or automatic circuit breaker, 3.15 Amp
Inline Fuse, switched dc Output	315 mAmp, medium time lag

6.2 Dimensions, Weight

Round Front Panel, 6 Watts	57 mm dia / 2¼ in. dia, fits into standard panel opening
Depth behind panel	200 mm / 7.85 in. (allow 30 mm / 1.2 in. for plugs and harness)
Overall Dimensions	Width = 63 mm / 2.5 in., Height = 58 mm / 2.28 in., Depth = 223 mm / 8.78 in.
Rectangular Front Panel, 6 Watts	47.5 mm x 146 mm, DZUS fastener
Overall Dimensions	Width = 146 mm, Height = 47.5 mm, Depth = 230 mm, installed
Weight round / rectangular units	0.81 kg / 1.1 kg, without harness and mating connectors
Weight FSG 90L, FSG 200FL	0.79 kg / 1.09 kg, without harness and mating connectors

6.3 Receiver

Receiver Type	Dual Superhet
IF Frequencies	First IF 10.0 MHz, second IF 455 kHz, high injection
Sensitivity (m = 30% / 1,000 Hz)	≤ 2 µV EMF (≤ -107 dBm / 50 Ω) for 6 dB S+N/N
Selectivity	SINAD decreased from 12 dB to 6 dB Reference level m = 60% / 1,000 Hz for 12 dB SINAD Interference level m = 60% / 400 Hz ≤ 6 dB for ± 8 kHz (25 kHz CH spacing) ≥ 60 dB for ± 17 kHz (25 kHz CH spacing) ≥ 70 dB for ± 25 kHz (25 kHz CH spacing) ≤ 6 dB for ± 3 kHz (8,33 kHz CH spacing) ≥ 60 dB for ± 7.37 kHz (8,33 kHz CH spacing)
Squelch Type	Automatic (FM/AM), adjustable (SETUP); manual override.

AGC Characteristic	≤ 6 dB, 2 μ V EMF (-107 dBm) ... 2 V EMF (+13 dBm / 50 Ω), m = 30% / 1,000 Hz
AGC Delay (RX)	≤ 0.1 sec, 200 mV EMF (-1 dBm) ... 2 μ V EMF (-107 dBm/50 Ω), m = 30%/1,000 Hz)
AGC Recovery after TX	≤ 0.1 sec at 10 μ V EMF (-93 dBm / 50 Ω), after TX end
Transfer time TX / RX	≤ 50 msec
Modulation distortion (AF Processor OFF)	$\leq 10\%$, 350 ... 2,500 Hz (m = 85%)
Audio Frequency Response / AF Fidelity	≤ -6 dB, 350 ... 2,500 Hz, 25 kHz and 8,33 kHz CH spacing ≥ -20 dB, 4 kHz, 25 kHz CH spacing (Climax Offset Operation)
Nominal AF Output (Speaker)	≥ 4 Watt / 4 Ω , or ≥ 8 Watt / 2 Ω (at 13.75 Vdc) ≥ 1.5 Watt / 4 Ω (at 10 Vdc)
Nominal AF Output (Phone)	≥ 100 mW / 600 Ω (at 13.75 Vdc) ≥ 50 mW / 600 Ω (at 10 Vdc)
AF Noise Level	≥ 40 dB, m = 30% / 1,000 Hz 200 μ V EMF (-67 dBm/50 Ω) ... 10 mV EMF (-33 dBm/50 Ω)
AF External Input	≤ 1 Volt into 600 Ω for rated AF output (13.75 Vdc supply)
Spurious Response	≥ 10 mV EMF (-33 dBm), m = 30% / 1 kHz, for S+N/N ≤ 6 dB a) 108 - 156 MHz (of any Test Channel $\leq \pm 8$ kHz), at other than the assigned channel and the adjacent channels b) 50 kHz – 1,215 MHz (except 108 - 156 MHz)
Cross Modulation (AF Processor OFF)	Max. AF output level ≥ 10 dB below nominal AF output level: a) Wanted signal 20 μ V EMF (-87 dBm) ... 500 μ V EMF (-59 dBm / 50 Ω), unmodulated at RX frequency, additional b) Unwanted signal 10 mV EMF (-33 dBm), m = 30% / 1,000 Hz, frequency 100 - 156 MHz (frequency $\leq \pm 2$ RX channels)
Intermodulation (AF Proc. OFF), ICAO	≤ 6 dB AF Quieting (-5 dBm / 50 Ω , 87.5 - 107.9 MHz), 2 signals
Intermodulation (AF Processor OFF), VHF Band	≥ 70 dB, for 6 dB AF Quieting VHF/AM Channel + 1 CH / + 2 CH, + 1 MHz / + 2 MHz VHF/AM Channel - 1 CH / - 2CH, - 1 MHz / - 2 MHz
Desensitization	Wanted signal 20 μ V EMF (-87 dBm), m = 30% / 1,000 Hz, at RX frequency, for S+N/N ≥ 6 dB, in the presence of Unwanted signal A 10 mV EMF (-33 dBm / 50 Ω), unmodulated, frequency 108 ... 156 MHz, except used CH, but includes ≥ 1 RX CH, or Unwanted signal B 200 mV EMF (-7 dBm / 50 Ω); minimum 10 mV EMF (-87 dBm), unmodulated, frequency 50 kHz – 1,215 MHz, except 87.5 MHz ... 156 MHz, or Unwanted signal C 250 mV EMF (-5 dBm), unmodulated, frequency 87.5 ... 107.9 MHz
Receiver Spurious Emission	≤ 400 pW / -64 dBm (50 kHz ... 1,215 MHz)
Channel Selection Time	≤ 0.4 sec, AF level within 3 dB, max. 99 Channel memories
Receiver Muting, Squelch (CLIMAX)	Simultaneous input at RX frequency: a) Wanted Signal A : 10 μ V EMF (-93 dBm) +8 kHz (m = 30% / 1,000 Hz), Squelch is open. b) Unwanted Signal B : More than 24 μ V EMF (-85 dBm), m = 30% / 1,000 Hz, vary this frequency slowly from -8 kHz to +4 kHz. Squelch must remain open.

6.4 Transmitter

Nominal TX RF Output Power (normal operation), FSG 90(X), FSG 200(X)	≥ 6 Watt / 50 Ω (carrier), ≥ 20 Watt PEP, at 13.75 Vdc -0.5 dB ... + 1,5 dB
Nominal TX RF Output Power (normal operation), FSG 90(X)-H1, FSG 200(X)-H1	≥ 10 Watt / 50 Ω (carrier), ≥ 30 Watt PEP, at 14.00 Vdc -0.5 dB ... + 1 dB
Nominal TX RF Output Power (emergency operation), FSG 90(X), FSG 200(X)	≥ 1.5 Watt / 50 Ω (carrier) at 10 Vdc supply
Nominal TX RF Output Power (emergency operation), FSG 90(X)-H1, FSG 200(X)-H1	≥ 3.5 Watt / 50 Ω (carrier) at 10 Vdc supply
TX Duty Cycle	1 : 4 (1 minute TX / 4 minutes RX)
TX Time Out Timer	After 2 minutes continuous TX. Transmitter is unkeyed automatically and the radio display flashes as a warning.
Modulation	Amplitude modulation, AM (A3E)
Depth of Modulation	$\geq 80\%$ (Voice processor with dynamic compression)
Modulation Distortion	$\leq 10\%$ (m = 80% / 1,000 Hz) $\leq 15\%$ (m = 80% / 350 ... 2,500 Hz)
Modulation Audio Frequency Response	$\leq +2$ dB / -4 dB (350 ... 2,500 Hz)
Modulation AF Input for m = 70%	Dynamic Microphone: ≤ 0.5 ... 10 mV symmetrical, sensitivity adjustable in SETUP. Amplified/Carbon Microphone: ≤ 80 ... 500 mV unsymmetrical, sensitivity adjustable in SETUP.
True Transmit Sidetone (derived from modulated TX RF signal)	≥ 100 mW / 600 Ω (at 13.75 Vdc supply), ≥ 50 mW / 600 Ω (at 10 Vdc), volume adjustable in SETUP, independent from speaker volume
Carrier Noise Level	≥ 45 dB (m = 70% / 1,000 Hz)
Emission of RF Energy (≤ 1000 MHz)	$\leq 0,25$ μ W (-36 dBm) / 71 dB μ V / 3.54 mV / 50 Ω ≤ 4 nW (-54 dBm) / 53 dB μ V / 446 μ V / 50 Ω , from 47 ... 68, 87.5 ... 108, 162 ... 244, 328 ... 336, 470 ... 862 MHz
Emission of RF Energy (≥ 1000 MHz)	$\ll 1$ μ W / $\ll -30$ dBm / $\ll 77$ dB μ V / $\ll 7$ mV / 50 Ω
Transmitter Spectrum Mask	Max. +2 / -4 dB at 350 ... 2,500 Hz modulat. (8.33 kHz spacing) ≥ 45 dB at 3,200 Hz modulation (8.33 kHz spacing) ≥ 60 dB at $\geq 5,000$ Hz modulation (8,33 kHz spacing)
Channel Selection Time	≤ 0.5 sec
Frequency Tolerance	≤ 1 ppm (0°C ... + 40°C / 32°F ... 104°F), ≤ 1.5 ppm (-20°C ... + 55°C / -4°F ... + 131°F)
Unwanted FM (Frequency modulation)	≤ 1.0 kHz at m = 70% / 1,000 Hz
TX Intermodulation	≥ 45 dB
Antenna Mismatching	VSWR $\leq 3 : 1$, normal operation At VSWR 3 : 1 the requirements for modulation distortion, spurious and harmonics output as well as frequency stability are met. In addition, the RF output is $\geq 40\%$: ≥ 2.4 Watt into 50 Ω at 13.75 Vdc, FSG 90(X), FSG 200(X) ≥ 6 Watt into 50 Ω at 14.00 Vdc, FSG 90(X)-H1, FSG 200(X)-H1 At VSWR $\leq 5 : 1$ still functional.

7.0 Statement of Conformance with applicable JTSO

It is hereby declared that all of the 12 (twelve) models of each variant

- **FSG 90(X)**
- **FSG 90(X)-H1**
- **FSG 200(X)**
- **FSG200(X)-H1**

fully comply with all applicable JTSO standards, except on deviations as described below.

7.1 Deviation from JTSO Standards

Deviation from compliance stated above refers to ED-23B § 5.2.1.7 Receiver Effective Bandwidth test procedure.

Due to the not accessible AGC level of the **FSG 90 family** and **FSG 200 family** receiver system, the required effective bandwidth compliance measurements were performed using the method of SINAD reduction from 12 dB to 6 dB, involving two signal generators and a decoupling test setup.

7.2 Firmware / Software

- EUROCAE ED-12B / RTCA DO-178B Software considerations are met.
- It is hereby stated, that the software complies with ED-12B / DO-178B, Level **D**.
- Only the manufacturer and authorized service facilities can perform specific functional checks and integral functional calibration, using specific software and computer interface.
- All functions are demonstrated comprehensively through measurement procedures and measurement results stated in the QTR Qualification Test Report.
- For the user, it is not possible without specific external computer interfacing and specific Service Software, to access or to change the **FSG 90(X)** and **FSG 200(X)** equipment integral firmware function.

8.0 Reference to applicable Qualification Test Report

This DDP refers also to the Qualification Test Report QTR 031.00, issued December 01, 1997 which covers all 12 models **FSG 90(X)**.

The amendment 1 to this QTR Qualification Test Report covers additional measurement result listings for the **FSG 90(X)-H1** models.

The technical features of the 24 models **FSG 200(X)** are identical with the 24 models **FSG 90(X)**. No additional measurements are performed and listed in the QTR for the 24 models **FSG 200(X)**, since **FSG 200(X)** differ only in front panel text content ("FSG 90" and "Dittel" are removed).

9.0 Reference to Manuals for Maintenance, Overhaul, Repair, Operation

This DDP refers to the following manuals

<u>Part Number</u>	<u>Description</u>
MRM 031.00	FSG 90, FSG 90-H1 , Maintenance & Overhaul (English Manual)
MRM 031.00E	FSG 90E, FSG 90E-H1 , Maintenance & Overhaul (English Manual)
MRM 034.00	FSG 90F, FSG 90F-H1 , Maintenance & Overhaul (English Manual)
MRM 034.00E	FSG 90FE, FSG 90FE-H1 , Maintenance & Overhaul (English Manual)
IM 031.00	FSG 90, FSG 90-H1 , Installation & Operation (English Manual)
IM 031.00E	FSG 90E, FSG 90E-H1 , Installation & Operation (English Manual)
IM 034.00	FSG 90F, FSG 90F-H1 , Installation & Operation (English Manual)
IM 034.00E	FSG 90FE, FSG 90FE-H1 , Installation & Operation (English Manual)
EB 031.00	FSG 90, FSG 90-H1 , Einbau & Bedienung (German Manual)
EB 031.00E	FSG 90E, FSG 90E-H1 , Einbau & Bedienung (German Manual)
EB 034.00	FSG 90F, FSG 90F-H1 , Einbau & Bedienung (German Manual)
EB 034.00E	FSG 90FE, FSG 90FE-H1 , Einbau & Bedienung (German Manual)
OM 031/1.00	FSG 90 , Operating Instructions
OM 031/2.00	FSG 90-H1 , Operating Instructions
OM 031/3.00	FSG 90E , Operating Instructions
OM 031/4.00	FSG 90E-H1 , Operating Instructions
OM 034/1.00	FSG 90F , Operating Instructions
OM 034/2.00	FSG 90F-H1 , Operating Instructions
OM 034/3.00	FSG 90FE , Operating Instructions
OM 034/4.00	FSG 90FE-H1 , Operating Instructions
BA 031/1.00	FSG 90 , Bedienungsanleitung
BA 031/2.00	FSG 90-H1 , Bedienungsanleitung
BA 031/3.00	FSG 90E , Bedienungsanleitung
BA 031/4.00	FSG 90E-H1 , Bedienungsanleitung
BA 034/1.00	FSG 90F , Bedienungsanleitung
BA 034/2.00	FSG 90F-H1 , Bedienungsanleitung
BA 034/3.00	FSG 90FE , Bedienungsanleitung
BA 034/4.00	FSG 90FE-H1 , Bedienungsanleitung

NOTE: Similar manuals for **FSG 200** will be processed on demand, with contents identical to FSG 90, as a guide for the OEM customer only. The final manual content will be processed by the OEM customer itself, whereby only the OEM identification may be revised. Technical content shall be similar to the FSG 90 manuals.

10.0 Limiting Conditions of use

Walter Dittel GmbH cannot accept responsibility for equipment used outside the limiting conditions stated above without their agreement.

11.0 Signatures of Authorized Representative

Walter Dittel GmbH promise to issue any new editions of this declaration whenever the item of equipment is the subject to a minor or major change, and to apply, when relevant, the firmware assurance plan and the configuration management plan.

Date: October 27, 1999

Signed:
 Ing. Werner Weiler
 Head Design Dept.
 Walter Dittel GmbH