3M Technical Information

# Installation- and User Manual

## 3M™ Driver Feedback Sign DFS 600

## Manufacturer and Distributor

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For questions please first contact your local dealer that you obtained your DFS 600 from.

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# 1 Notes on this Document

These operating instructions for the DFS 600 Speed Feedback and Warning System are a basis for the faultless operation of the 3M™ Driver Feedback Sign DFS 600 by the operator.

In the operating instructions the equipment is given the abbreviated name DFS 600.

The responsible installers and operators must read, understand and follow these operating instructions. Only with knowledge of these operating instructions can errors damage and injury be avoided and fault-free operation assured.

The operating instructions are to be kept within easy reach of the DFS 600 and accessible to the operators and maintenance personnel.

3M accepts no warranty and no liability for operating faults or damage that arises as a result of failure to follow these operating instructions.

Particular subjects are highlighted as follows:

*Working and operating procedures, which have to be followed exactly so as to exclude life-threatening injuries.*

*Working and operating procedures, which have to be followed exactly so as to exclude danger to persons.*

NOTE *Working and operating procedures, which have to be followed exactly so as to damage to or destruction of the equipment.*

*Technical information to which the equipment operator must pay particular attention.*

The picture presentations are numbered sequentially per chapter. Some of the figures have legends. References to figures in the text, e.g. (3-1 Item 2), mean:

3.1 = Figure 3.1

Item 2 = Item 2 of the legend to the picture.

In the event of technical problems not addressed in these instructions, please contact your dealer or local 3M subsidiary.

# 2 Safety Tips - Warranty/Liability

## Basic Information

(1) The DFS 600 has been built in accordance with state-of-the-art technology and recognised safety rules and norms in the EC Guideline. Nevertheless, dangers to the life and limb of the user or a third party, or impairments to the device or other property may occur with its use.

(2) Only use the DFS 600 in a technically perfect condition and in accordance with legal provisions, in full awareness of safety and dangers by following the operating instructions! In particular, repair faults that may impair safety immediately yourself or have them repaired by the service company.

(3) The DFS 600 is exclusively intended to measure and display the speed, measured by the built-in radar equipment, of vehicles passing in front of it. An alternative or more extensive use is deemed to be improper.

The manufacturer/supplier is not liable for damages occurring as a result of this. The user alone bears the risk.

Proper use also includes following the operating instructions and complying with the service and maintenance conditions.

(4) Keep the operating instructions within reach in the place where the device is installed.

(5) In addition to the operating instructions, all generally valid legal and other binding regulations governing accident prevention and protection of the environment are to be obeyed and applied!

(6) The DFS 600 is to be set up in traffic in accordance with EN 12899-1 “Fixed vertical road traffic signs - Part 1 Fixed Signs”. The equipment must only be mounted on a fixed pole or a solid fixture.

(7) Select the setup site such that the work of setting up is not endangered by traffic. If necessary secure the setup site with reflective tapes or warning signs and, where appropriate, work with auxiliary personnel. Only work with approved lifting gear. Where ladders are used, support them.

(8) The equipment must not extend into the free space of the traffic to be monitored, so it can not impair traffic.

(9) The personnel charged with working on the equipment must read these operating instructions and this chapter “Safety Tips” in particular before work begins. This applies most particularly to personnel employed only occasionally, e.g. for connecting the equipment to mains power.

(10) Follow the safety advices on the device and keep them in a legible condition.

(11) Where safety-relevant changes occur to the equipment, shut it down immediately. Have the fault repaired.

(12) Do not make changes, additions and conversions to the equipment unless they are expressly provided for in these operating instructions (e.g. replacing the frame, connecting external flashing lights, etc.). This also applies to the fitting and adjustment of safety devices.

(13) Spare parts must meet the technical requirements specified by the manufacturer. Only original 3M spare parts guarantee this.

(14) Only employ trained, properly instructed and authorised personnel. Clearly specify the responsibility of the personnel for operation and assessment.

### Safety Tips for Operation

(1) Refrain from any method of working that puts safety at risk.

(2) In the event of functional faults shut the equipment down and secure it. Have faults repaired immediately.

(3) Switch the equipment on and off, and monitor control displays as specified in the operating instructions.

(4) Lay the mains cable such that it is not under tension or causes obstruction. Nothing should be placed on the cable.

(5) Where an earth cable is used, the earth conductor must have a suitable cross-section and connect into a grounding system of safe capacity.

(6) For CE compliance keep attached cables below 3 m length.

## Notes on certain types of danger

### Electrical power

(1) To connect the DFS 600 to the public power supply outdoors, a connection must be available that satisfies the local electrical guidelines and safety requirements.

NOTE

*The power supply line phase [brown/black wire] must be secured with a suitable fuse, typically 4 to 6 A. Otherwise the electronics in the DFS 600 may be damaged or destroyed in case of over-current.*

*When the DFS 600 is in a fixed installation, e.g. to street lights, a disconnectable over-current protective device (max. 6A) according to EN60950 must be installed between the power supply line and the DFS 600. For service work on the DFS 600 the power supply must be disconnected via the over-current protective device.*

*The over-current protective device is to be installed in accordance with the local electrical guidelines and safety requirements. Therefore in Scandinavia, for example, a cut out must have a 2-pole connection against grounding.*

(2) The electrical connections must always be produced in accordance with the requirements for the intended location. In the case of fixed installations the plug on the power supply unit or the Charger may have to be removed.

(3) Only use fuses of the prescribed rating. In the event of faults in the power supply shut the equipment down immediately.

(4) Work on the electrical equipment or fittings (e. g. Charger) must only be carried out by a qualified electrician or by trained personnel under the management and supervision of a qualified electrician in accordance with electrical engineering rules.

(5) Parts, on which tests, maintenance and repair are being carried out, must have the power to them disconnected. The disconnected parts must be initially tested for zero voltage then grounded and shorted. Adjacent parts with power still connected to them must be isolated!

(6) The electrical equipment on the DFS 600 is to be checked regularly. Defects, such as loose connections or burnt cables, must be removed immediately.

(7) If work is required on disconnected parts, take a second person along who can trigger a power-down in an emergency.

(8) Use only insulated tools

Power Supply Unit (power box) (if available)

(1) As a basic principle the Power Supply Unit box is provided for use on the DFS 600, but can also be used separately, taking into account the vertical alignment when placed indoors (workshop, office) or outdoors (next to mounting location).

(2) Do not open/disassemble the Power Supply Unit box. Completely replace damaged or non-functioning Power Supply Unit boxes, including the two cables. This also applies to cable damage.

Battery (if available)

(1) Do not remove the Battery pole caps. A short circuit, which can destroy the Battery, is created by bridging the positive and negative poles with metal. There is a risk of injury as a result of parts heating up or arcing voltages.

(2) The Battery cable and poles should be undamaged; otherwise the Battery is to be replaced.

(3) As a basic principle charge the Battery using the Charger.

(4) Only charge and discharge removed Batteries in ventilated areas, as charging causes poisonous and flammable gases to develop. No Smoking! Keep children away!

(5) Do not cover the Battery and do not place on radiators, heaters or open fires. Avoid contact with water.

NOTE *The optional Battery Box is the best location for the Battery while charging and in use!*

(6) The Battery fluid is corrosive! On contact with skin, the eyes or clothing, wash the area affected in plenty of water. On physical contact consult a doctor (contact with sulphuric acid).

(7) The Battery must be recycled or properly disposed of. Disposing of the Battery in domestic waste is prohibited.

(8) The Battery may not be beaten, disassembled, damaged, dumped or burned in an open fire. The danger of an explosion otherwise exists.

(9) Only transport Batteries wearing eye protection and acid-resistant gloves.

(10) Only work on Batteries wearing eye protection and protective clothing.

Battery Charger (if available)

(1) The Battery Charger is exclusively approved for charging the DFS 600 Battery.

(2) As a basic principle the Charger is provided for indoor use (workshop, office) but inside the Battery Box it can also be used outdoors. To avoid overheating, do not cover the Charger during a charging cycle.

(3) The epoxy resin-filled Charger is spray-proof, but must not be immersed in water for long periods (IP67).

(4) The mains socket or a power disconnect must be easily accessible. If an operating fault occurs, remove the plug from the socket immediately or disconnect the power.

(5) Hazardous voltages exist inside the Charger. Do not open/dismantle the Charger. Avoid damage.

(6) The charging cycle can cause explosive gases to develop. Avoid sparks and open flames. Ensure there is adequate ventilation during a charging cycle. The Charger may not be used in the immediate vicinity of combustible anaesthetic gases. The plastic casing should not come into contact with oil or grease etc., as it can be dissolved by chemicals and solvents.

(7) The charger only must run in a temperature range from -40°C to +40°C

NOTE *The optional Battery Box is the best location for the Charger while charging and in use.*

### Radar

(1) The radar beam may be damaging to the eyes. Do not look directly into radar radiation!

### Return and Waste-Disposal of Electrical and Electronic Devices and Batteries

(1) Please contact your 3M dealer or 3M Customer Service about the free return of electrical and electronic devices and their components in accordance with WEEE Guideline 2002/96 EC.

(2) Old Batteries are to be returned to the distributor or to a public waste-disposal facility.

### Warranty

All warranty and liability matters regarding the DFS 600 are defined by the current sales contractual conditions, provided that legal regulations don't state otherwise.

Damages caused by improper installation or operation or as a result of excessive operational demands or the use of unsuitable product components is excluded from any kind of warranty and liability in all cases.

NOTE *The equipment must only be used by properly trained persons. Otherwise the warranty according to the delivery terms and conditions expires immediately.*

### Device Identification

The type label bearing the CE mark is located on the rear of the speed display device.

The type label gives the following information:

- Manufacturer's details
- Device type
- Serial number
- Electrical data.

# 3 Overview of the device

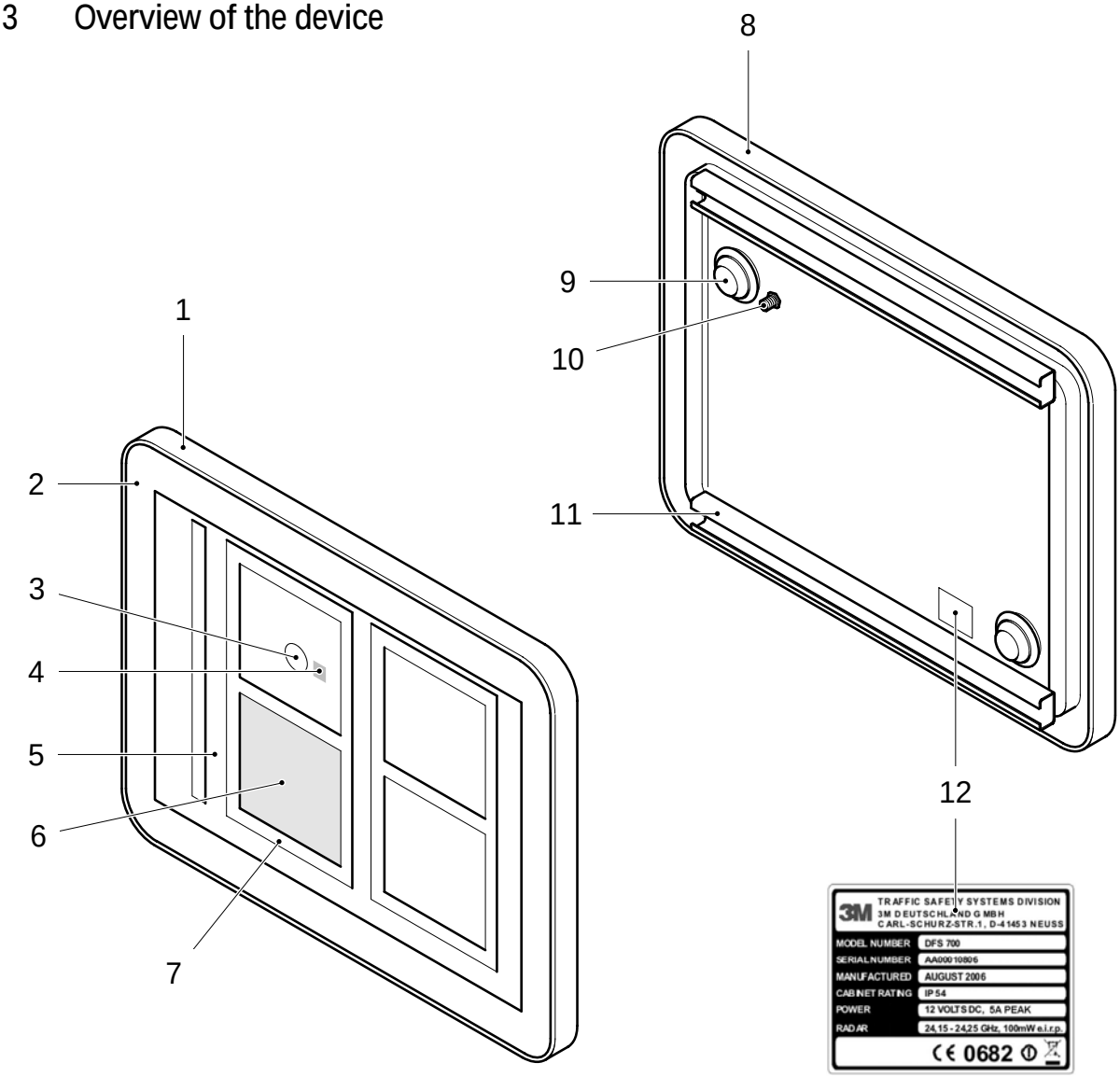



Figure 3-1 Overall view of DFS 600

1 DFS 600 front view
2 Reflective coating (DG$^3$, white)
3 Sensor for measuring ambient brightness
4 Magnetic switch position (hidden)
5 Speed display device
6 Radar sensor position (hidden)
7 LED display bars, red and green coloured
8 DFS 600 back view
9 Ventilation fittings
10 M12 connector for electricity supply
11 C rail; 2x
12 Identification label

## Delivery package

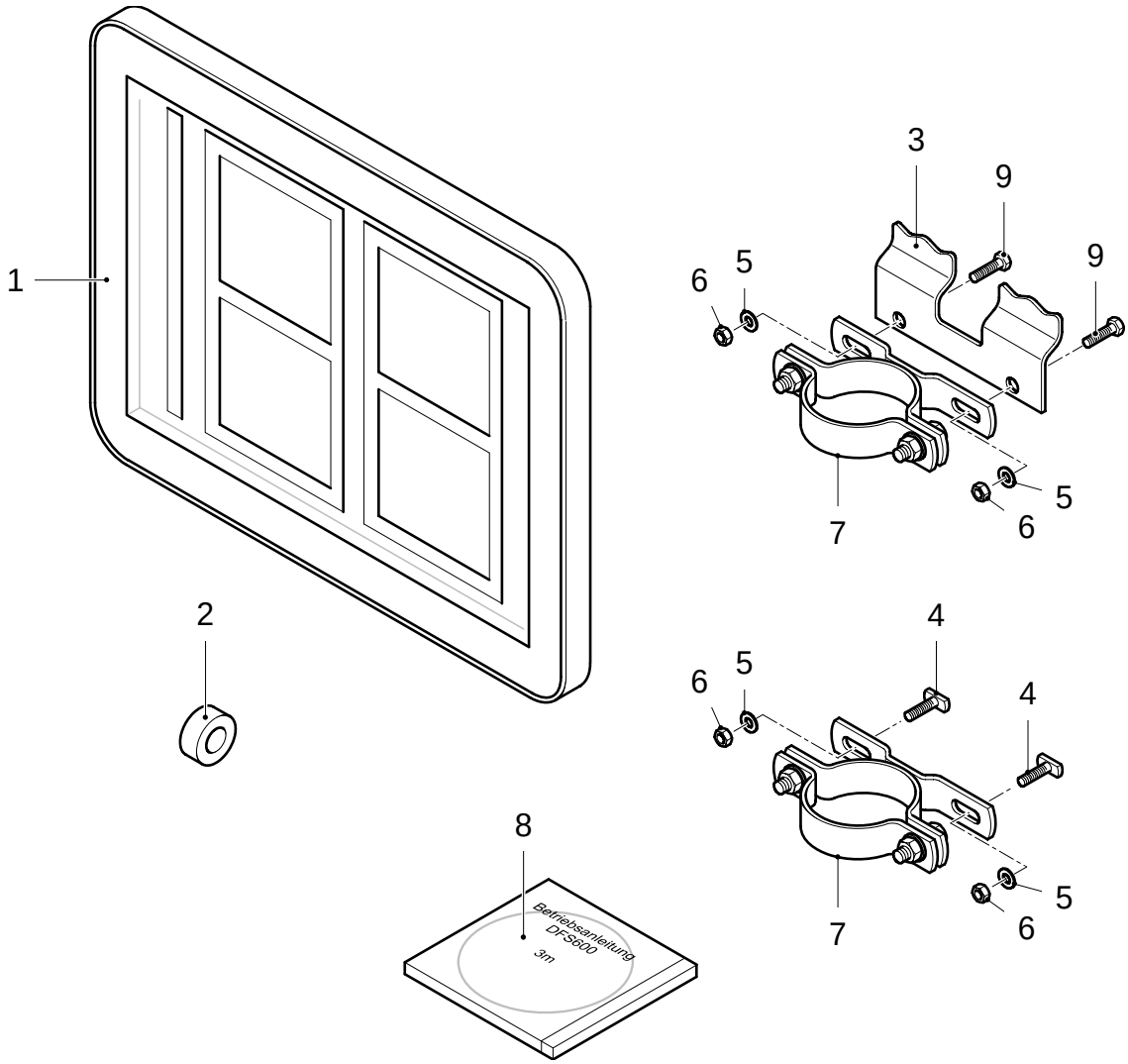



Figure 3-2 DFS 600 delivery package

In the standard model the DFS 600 comprises the following parts:

1 DFS 600
2 Magnetic key
3 Mounting plate
4 T-bolt; 2x
5 Washer; 4x
6 Hexagonal nut; 4x
7 Pipe cuff, complete, 60 mm; 2x
8 Operating instructions (CD)
9 Hex head bolt; 2x

*On delivery, please check for completeness and condition of parts. In the event of complaints, please contact 3M Customer Services, see Page II.*

## Equipment for electricity supply

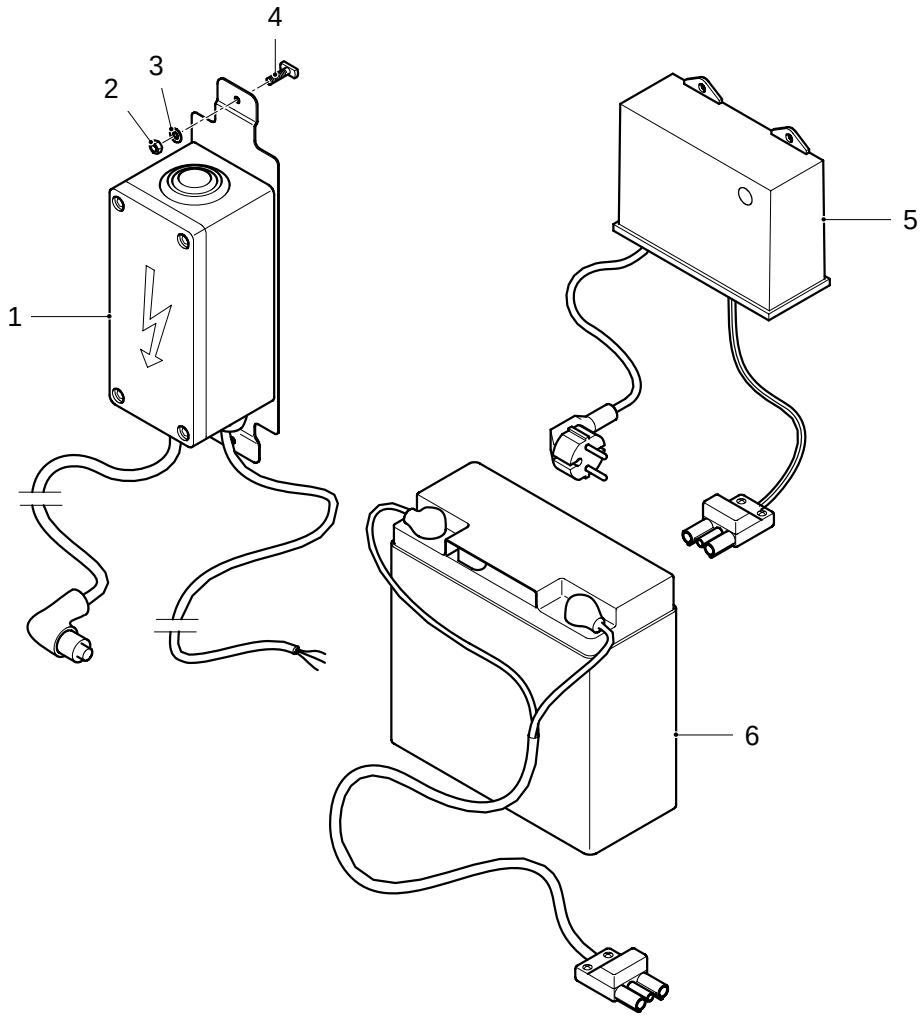



Figure 3-3 Electricity supply equipment for the DFS 600

*These parts are not part of the DFS 600 delivery package!*
*The individual components must be ordered separately depending on the electricity supply to be used!*

1 Power supply unit box (power cable) with mounting plate
2 Hexagonal nut
3 Washer
4 T-bolt
5 Battery charger with 12 V charging cable
6 Battery 12 V, 17 Ah, with connector cable

## Optional accessories

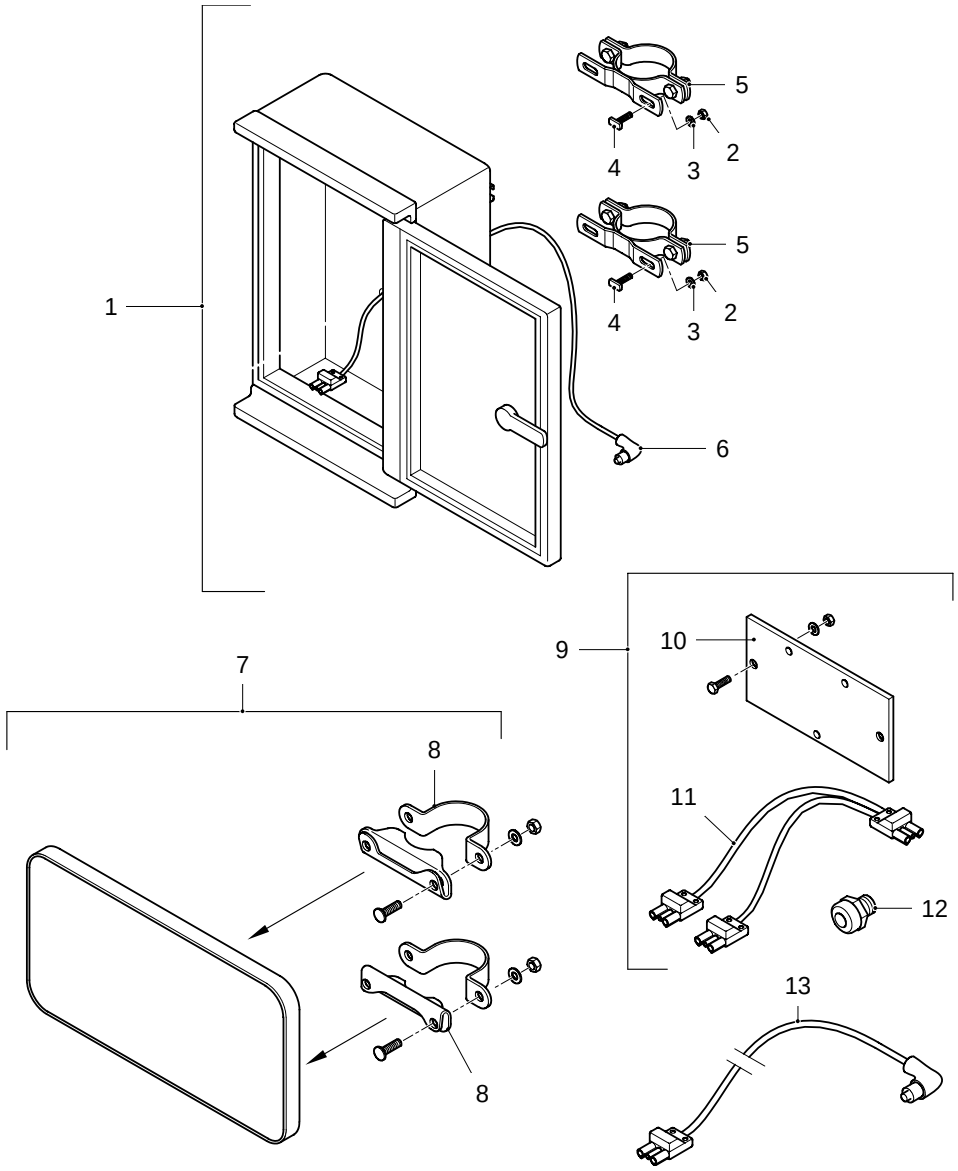



Figure 3-4 DFS 600 Optional accessories

1 Battery box
2 Hexagonal nut; 4x
3 Washer; 4x
4 T-bolt; 4x
5 Pipe cuff, complete, 60 mm; 2x
6 DFS 600 connector cable with plug M12
7 Reflective signboard
8 EKS cuff, complete, 60 mm; 2x
9 Charger mounting kit
10 Mounting plate
11 DFS branching cable, charger and battery
12 Cable-holders for installation of DFS 600 charger
13 Battery cable, 2 m

# 4 Technical description

## 4.1 Intended use

The DFS 600 (Figure 3-1) is used to measure and display the speed of vehicles driving into the radar beam. These measurements are displayed in figures to the vehicle just measured.

The monitoring of vehicle speeds in flowing traffic is particularly useful for the following traffic zones:

- Traffic zones with special speed limits e.g. residential areas, inner city areas, roadworks.
- Dangerous traffic spots, e.g. curves, bridges, tunnels.
- Traffic zones that must be driven with particular care e.g. past hospitals, schools, bus stops, roads whose surfaces produce noise or are dirty.

The spray-protected DFS 600 can be used outdoors at all times and regardless of the weather given the appropriate power supply. Thanks to the reflective coating on the frame (Figure 3-1 Item 2) the DFS 600 can easily be seen during the day and especially in the dark in the headlights. If necessary an additional reflective sign which may show additional written directions (Figure 3-4 Item 9) can be attached above the DFS 600.

## 4.2 Function and how it works

In its ready-to-use state (power supply provided and presets selected) the radar sensor (Figure 3-1 Item 6) measures the speed of an approaching vehicle. The radar sensor is located in the lower field of the central figure.

In normal operation this vehicle speed is displayed in LED digits (Figure 3-1 Item 7) on the DFS 600 (Figure 3-1 Item 5). The colour of the digits can be set to red or green.

As a rule, speeds set as permissible are displayed in green and speeds exceeding these in red.

The LED digits adjust their light intensity to the ambient light.

A suitable light sensor (Figure 3-1 Item 3) is located in the upper field of the central figure.

The lighted digit display can also be set to flashing from an adjustable speed threshold upwards.

The speed display unit contains a 2½ LED digit display that can display a maximum value; of 199. It consists of a total of 25 light segments that can be tuned to match each other (12 segments per number (any number), 1 segment for the 1).

Under optimum environmental conditions, the digits can be read at a distance of over 100 m.

The electrical connection (Figure 3-1 Item 10) is located on the back of the speed display unit.

The speed display unit has passive internal ventilation provided by two ventilation fittings (Figure 3-1 Item 9). The vents must always be kept clear.

The DFS 600 is fitted to a tube of diameter 60 mm with the two pipe cuffs (Figure 3-2 Item 7).

## 4.3 Power supply options

The DFS 600 may be used with various power supply options depending on the version.

*A power supply unit box (Figure 3-3 Item 1) and/or a 12 V battery (Figure 3-3 Item 6) with or without a battery charger (Figure 3-3 Item 5) are available for the DFS 600's power supply and these must be ordered as extras depending on the desired mode of use.*

NOTE *Observe installation instructions and electrical connections per Section 6!*

- Mains operation (constant power supply)

  The DFS 600 is installed in a fixed position and connected to the mains via the power supply unit box.

- Battery buffer operation (interrupted power supply)

  The DFS 600 may be operated with the battery and battery charger in the battery box. When the mains is switched off or there is a power failure, the unit is supplied by the battery.

  When the mains is connected, the battery charger recharges the battery.

- Battery operation (no mains power supply)

  The DFS 600 may be operated independently of the mains with a battery in the battery box.

## 4.4 Power supply equipment

*The power supply unit box, the battery and the battery charger are not supplied with the DFS600 in its basic version.*

### 4.4.1 Mains operation (constant power supply)

The 230 V power supply unit box (Figure 3-3 Item 1) provides the power supply via its two cables between the mains connection (100 V - 240 V) and the DFS 600 (12 V). The box is maintenance-free and waterproof and is not to be opened. The vents must always be kept clear.

In principle the power supply unit box is to be mounted on the back of the DFS 600. See Section 7.3.1.

If required, the power supply unit box may also be installed separately, taking into account the vertical alignment.

### 4.4.2 Battery buffer operation (interrupted power supply)

The battery charger (Figure 4-1 Item 7) designed specially for the DFS 600 is intended to be used only for charging the DFS 600's battery.

The battery charger is fitted with a mains cable and a cable with a suitable plug for the connection on the DFS 600.

When using the battery charger, buffered mains operation of the DFS 600 is possible. For this the battery charger must be installed in the optional battery box (Figure 4-1 Item 1). See Section 7.1.2.

The battery is charged by the charger being connected to the mains even if the DFS 600 is switched off if both the battery and the charger are connected to the DFS 600.

*With fixed installation of the charger to the mains, a mains filter is to be inserted into the supply cabling in order to comply with the CE directives. The following types may be used:*
*1. Schurter 5500.2034 FMLB-0109-2040*
*2. Schurter 5500.2043 FMW2-52-2/1.25.*

### 4.4.3 Battery operation (no mains supply)

The 12 V, 17 Ah battery (Figure 3-3 Item 6) specially designed for the DFS 600 is a lead battery with a gel filling. A cable with a connector appropriate to the connection on the DFS 600 is fitted to the battery poles. The battery and cable are a fixed unit.

Operation of the DFS 600 is possible independently of the mains with the battery.

The battery is disconnected from the DFS 600 by its voltage management system below a battery voltage of 10.8 V to prevent total discharge.

The battery is to be housed safely and in a weatherproof manner in the optional battery box (Figure 3-4 Item 2). This is ensured by the optional battery box. See Section 7.1.3.

For separate setup the battery must be given special protection from the weather and unauthorised access. (See Section 2).

NOTE *Using other manufacturers' batteries with the same performance data is possible. However, 3M will no longer provide a guarantee for the problem-free operation of the DFS 600. Only the 3M battery charger may be used for charging the batteries via the DFS 600.*

## 4.5 Optional equipment

### 4.5.1 Battery box

The battery box for the DFS 600 is used for the safe and weatherproof storage of the optional equipment components and for mounting on vertically set tubular poles with a diameter of 60 mm.

Inside the housing (Figure 4-1 Item 1) the battery (Figure 4-1 Item 6) is freestanding.

In addition, the charger (Figure 4-1 Item 7) is bolted to the back wall of the housing. The 230 V mains cable to the charger and the 12 V power supply cable to the DFS 600 are fed through the back wall.

A front door fitted with a seal frame (Figure 4-1 Item 4) closes off the housing. The rotating catch (Figure 4-1/5) on the door can be locked with the two keys supplied.

For the 12 V power supply cable to be fed through the housing, the battery plug must first be removed and afterwards refitted.

The 230 V mains cable can also only be fed through the housing with a free cable end and then be clamped to the charger afterwards.

*This work may only be performed by a qualified electrician! Risk of injury from electric shock!*

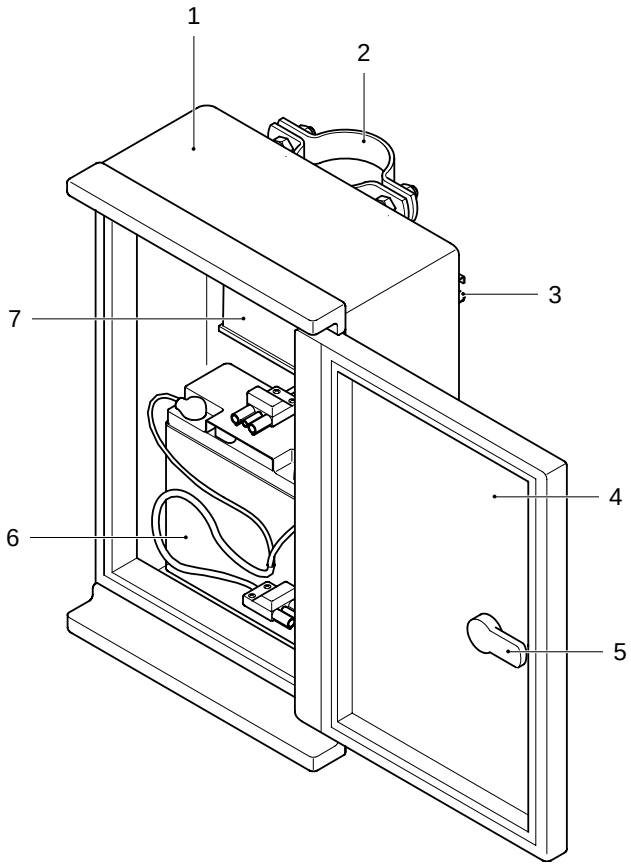



Figure 4-1 Battery box

1 Housing
2 Pipe cuff; 2x
3 C-rail; 2x
4 Front door
5 Rotating catch with lockable closure
6 Battery
7 Battery charger

Fixing of the battery box to a 60 mm tubular support is done with two pipe cuffs (Figure 4-1 Item 2), that are fixed to the housing from inside with four bolts.

### 4.5.2 Reflective signboard

The reflective signboard is also positioned above the DFS 600 and fixed with two EKS cuffs (Figure 4-2 Item 2).

Text or graphic information in film material may also be stuck to the reflective surface (Figure 4-2 Item 1). Only suitable 3M film material should be used so as not to damage the reflective surface.

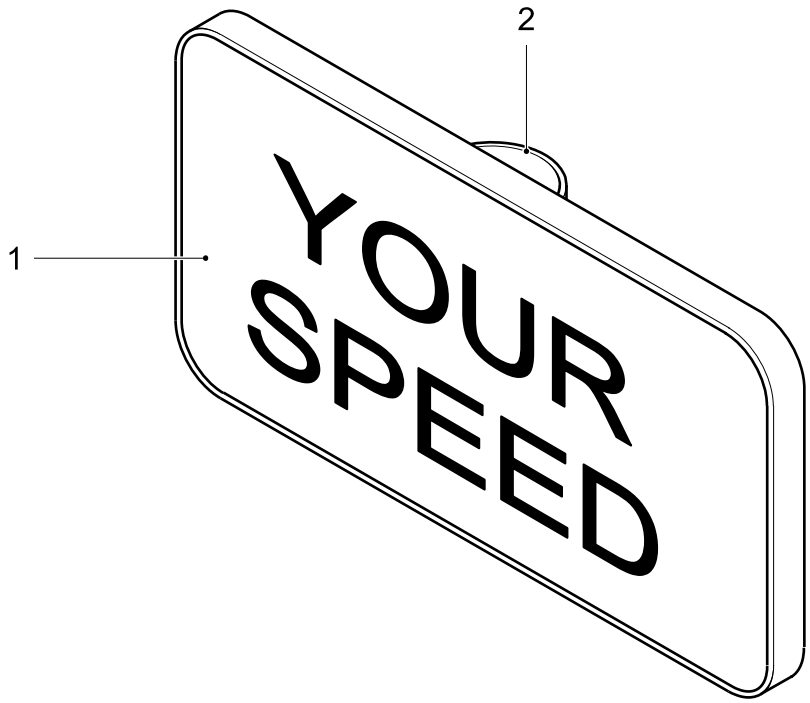



Figure 4-2 Reflective signboard

1 Reflective surface
2 EKS cuff; 2x

### 4.5.3 Charger mounting kit

The charger mounting kit (Figure 3-4 Item 9) is used to fix the charging device in the battery box. The mounting plate (Figure 3-4 Item 10) is bolted to the battery charger and then this assembly is bolted to the back of the battery box. The cable holders (Figure 3-4 Item 12) are to be inserted through a suitable drill hole to be made in the back wall for feeding through the DFS 600 connector cable. The battery charger, battery and DFS 600 connector cable are connected together via the branching cable (Figure 3-4 Item 11).

### 4.5.4 Battery cable

The 2 m-long battery cable can be connected directly between the battery and the DFS 600 for the installation work in enclosed spaces (Figure 3-4 Item 13).

# 5 Transport and Storage

## 5.1 Transport

For transporting the DFS 600, switched off and disconnected from the mains, and the accessories the original packaging should always be used. In addition, the front of the frame is to be protected by a soft cover.

For transport all outward-leading cables are to be laid such that they cannot hang loose.

The Battery must be removed from the Battery Box prior to transport and packed separately.

*Follow safety advices on handling the Battery, see Section 2.*

During transport do not hit the parts or subject them to strong vibration.

## 5.2 Storage

The DFS 600 and its accessories, switched off and disconnected from the mains, can be stored for up to 12 months at an ambient temperature of 20°C to 30°C and 55% relative humidity in a dry room.

*Follow safety advices on storage of Batteries, see Section 2.*

# 6 Configuration and operation

## 6.1 Summary of setup

These diagrams show the setup process through to operation of the DFS 600 (Figure 6-1).

The individual steps are shown and explained in the following sections.

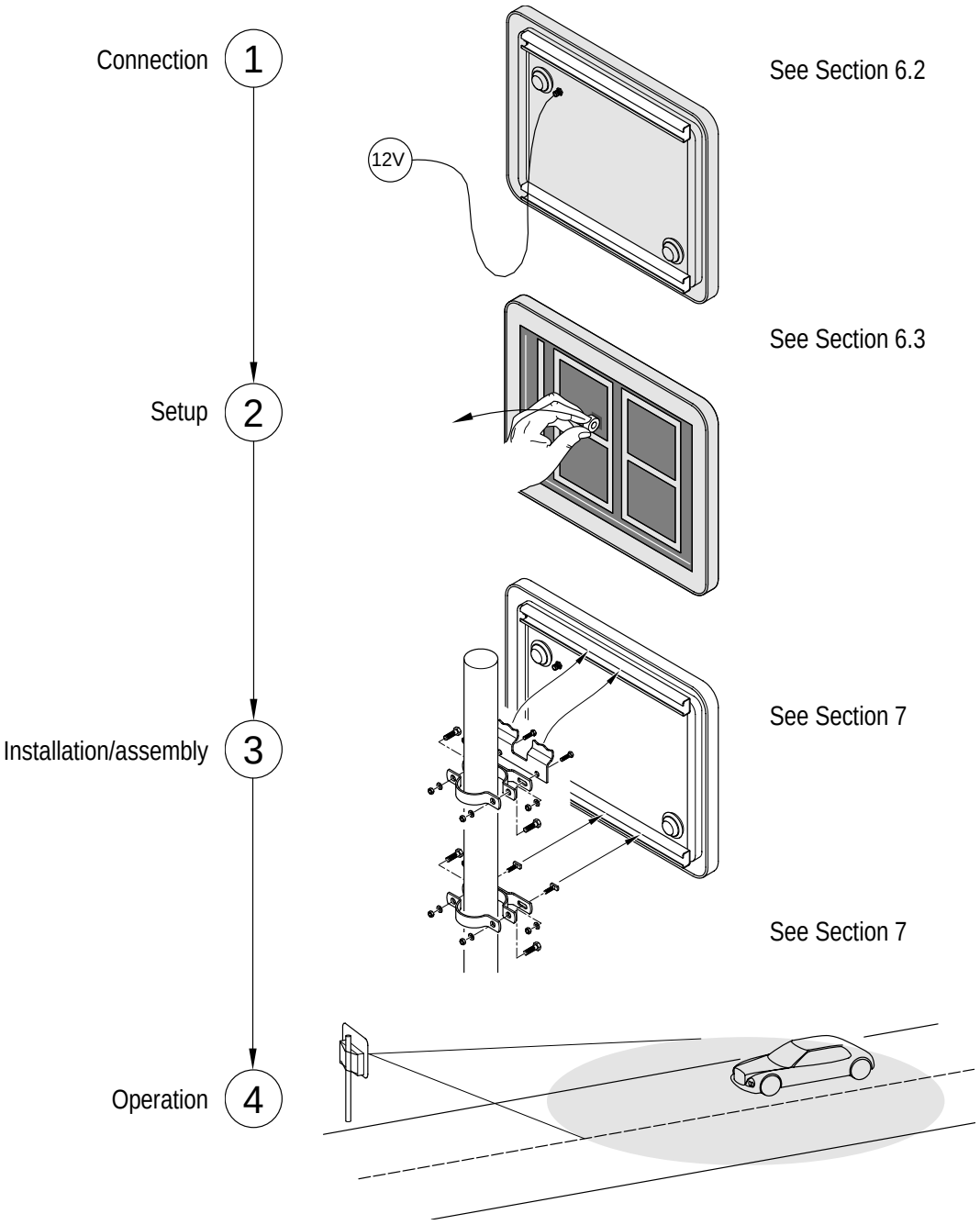
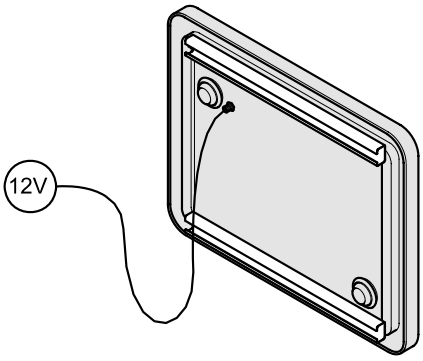



Figure 6-1 Setting up the DFS 600

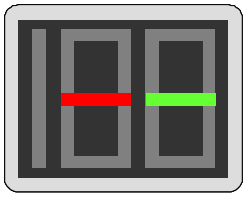
## 6.2 Connecting the DFS 600 and the power up process

The 12V power supply may be provided in various ways depending on the version available. The options are described in Section 7 and are to be implemented after setup.

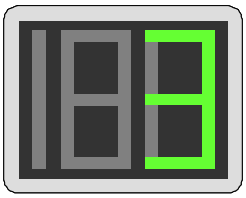
(1) Insert the M12 plug of the DFS 600 connector cable on the back of the DFS 600. With the connection to the 12V power supply, the DFS 600 is switched on and starts the power up process. Various displays appear one after the other.



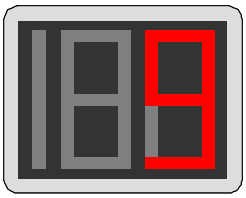

- The two middle bars light up alternately in green and red ca. 8x



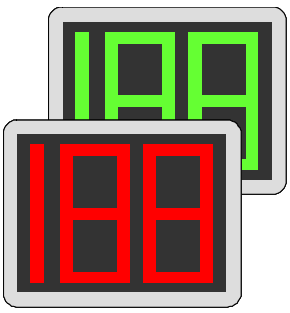
- A green figure appears in the right-hand number field, which shows the firmware status of the main unit.



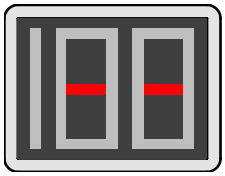
- A red figure appears in the right number field, which shows the firmware status of the radar



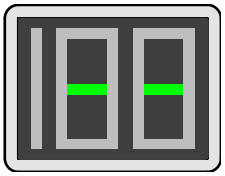
- The number “188” appears in the display, first in green then in red. The system is performing a self-test. If these numbers do not appear, the unit does not proceed with powering up. The input voltage is either too high or too low and this must be checked.



- After successful self check the two middle bars light up - in green for default parameter (displays km/h), or in red (displays mph).

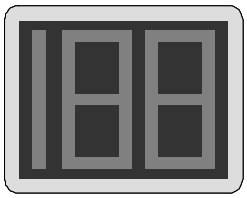


= mph

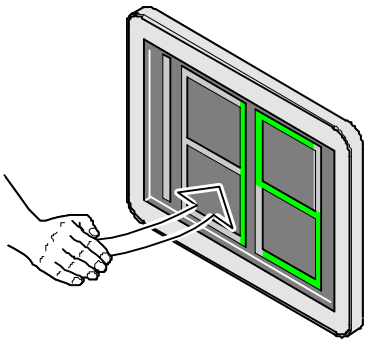


=km/h

- Lastly, the display goes out.



(2) Perform a functional test by moving a hand quickly past the display. The DFS must display a number!



(3) The DFS 600 is ready to work and the operating parameters can be set.

## 6.3 Setting the operating parameters

The setup steps are performed one after the other by bringing a magnetic key to and removing it from the sensor field of the magnetic switch (1 cm to the right by the light sensor, see Diagram 3-1/3) in the upper left number field of the display. The setting is stored until it is used again even after the power supply is disconnected.

*The setup of the operating parameters should not be done at the DFS 600's location installation*

*The time gaps between the settings to be input must not be too long otherwise the setup will have to be repeated from the start. It is recommended that the initial settings be done in advance without interruption so as to develop an appropriate routine for this procedure.*

### 6.3.1 Selection of km/h or mph

If it was established during the power up process that the speed display in km/h (green bars) or mph (red bars) needed to be changed, then the DFS 600 is to be reset to its delivered state (km/h).

(1) Hold the magnetic key to the magnetic switch while "188" is displayed in the power up procedure until the green bars appear and these change to red.

(2) Remove the magnetic key.

*Switching again is only ever possible by resetting to delivered condition.*

### 6.3.2 Setting operation mode

Radar mode is set in the DFS in its delivered condition. It can be changed between radar mode and demo mode.

- Measurement and display operations are performed in radar mode and the operating parameters are to be input for this mode.
- In demo mode the light display shows a series of numbers in alternating red/green colours and with flash frequency and various brightness levels to permit checking of the quality and range of the display.

(1) Hold the magnetic key to the magnetic switch and keep it there

(2) After about 2 seconds the unit changes its operating mode. Once the desired operating mode is reached, remove the magnetic key.

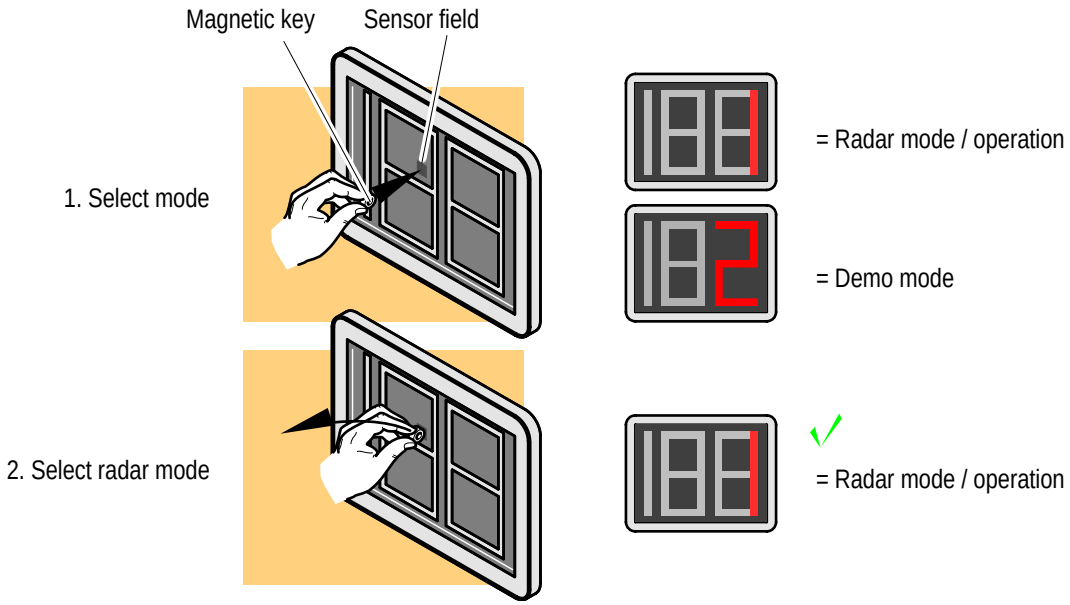



Figure 6-2 Setting the operating mode

In radar mode, four speed parameters are to be set one after the other for correct display:

- Lower display threshold
  Speeds measured that are above the set value are displayed in green or red on the DFS 600
- Upper display threshold
  Speeds measured that are above the set value are no longer displayed
- Transition threshold
  Speeds measured that are above the set value are displayed in red on the DFS 600
- Flash threshold
  Speeds measured that are above the set value are displayed flashing on the DFS 600.

Example of a common km/h speed setting

| | Parameter | Km/h | Display colour on setup | Colour displayed in operation |
|---|---|---|---|---|
| 1 | Lower display threshold | 10 | Green | Green from 10 km/h to 29 km/h |
| 2 | Upper display threshold | 100 | Red | No longer displayed from 100 km/h upwards |
| 3 | Transition threshold | 30 | Green | Red from 30 km/h to 100 km/h |
| 4 | Flash threshold | 40 | Red | Flashing red from 40 km/h to 100 km/h (upper display threshold) |

*You must ensure that the speed settings are compatible with each other. If this is not the case (e.g. lower display threshold higher than the upper display threshold), then nothing will be displayed. After the setting of every speed parameter, a reasonableness check of the other parameters is performed by the DFS 600 and they are automatically corrected if necessary.*

### 6.3.3 Setting operating parameters

Setting of the operating parameters take place in radar mode.

(1) Lower display threshold

Hold the magnetic key in place until a red “1” appears a second time. Remove the magnetic key and immediately hold it in place again and keep it there. The speed of the lower display threshold appears and starts to increase in steps of 5. Remove the magnetic key when the desired setting is reached.

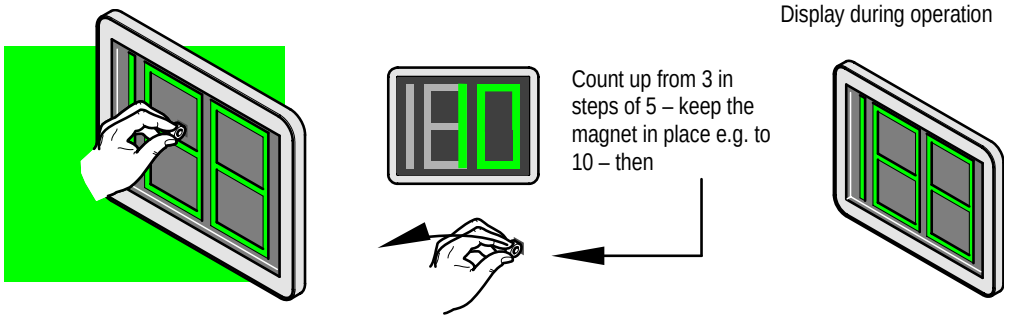



Figure 6-3 Lower display threshold

(2) Upper display threshold

Immediately hold the magnetic key in place again until a red number (e.g. 199) appears and count down the speed to be set in steps of 5 to the desired speed – then remove the magnetic key.

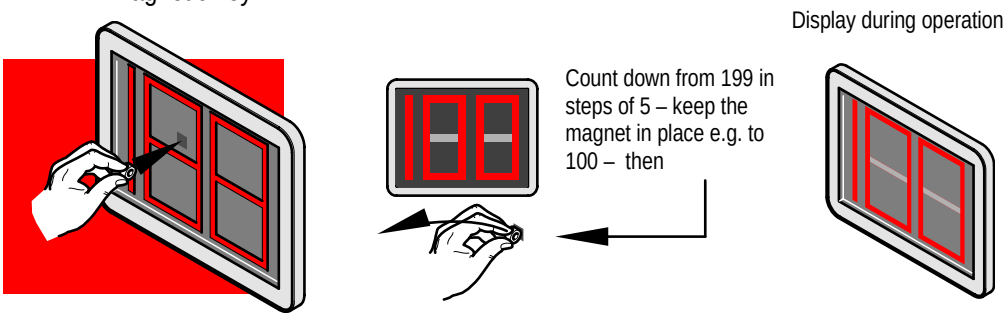



Figure 6-4 Upper display threshold

(3) Transition threshold

Immediately hold the magnetic key in place again until a green number (e.g. 50) appears and count up the speed to be set in steps of 5 to the desired speed – then remove the magnetic key.

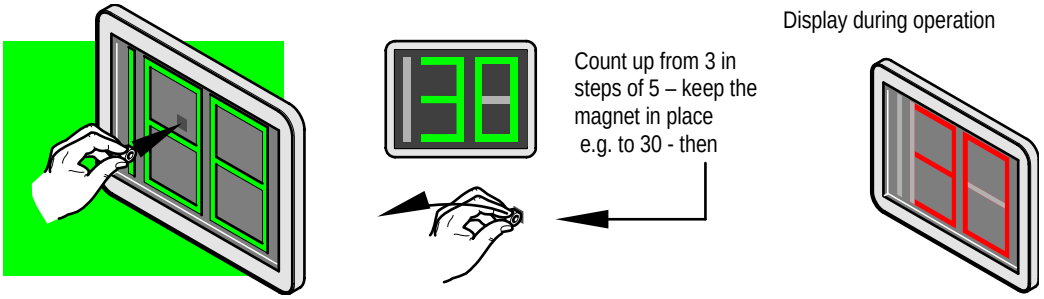



Figure 6-5 Transition threshold

(4) Flash threshold

Immediately hold the magnetic key in place again until a red number (e.g. 75) appears and count up the speed to be set in steps of 5 to the desired speed – then remove the magnetic key.

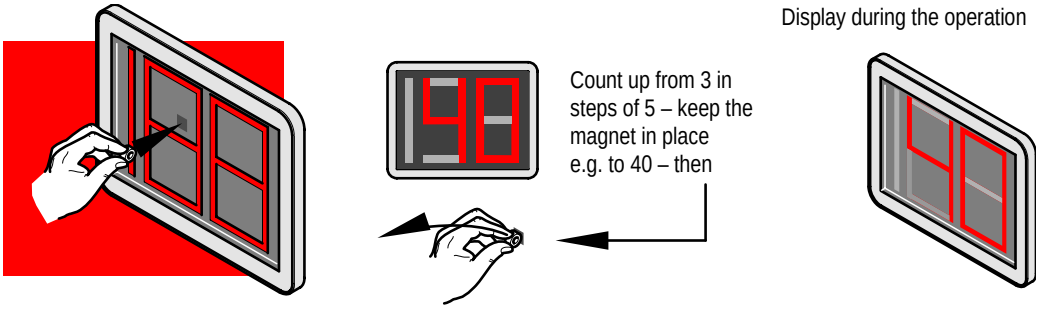



Figure 6-6 Flash threshold

The display goes out and the operating parameters are set and stored.

(5) Parameter query

Hold the magnetic key in place and wait until the “Radar mode” operating mode is displayed, then remove the magnetic key. The speed values are displayed one after the other.

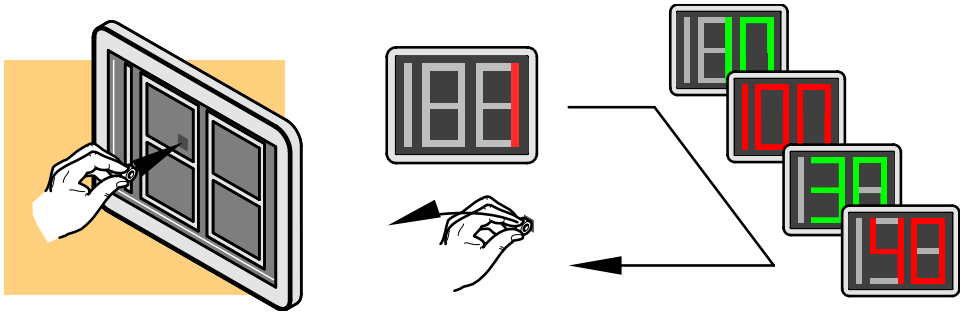


Figure 6-7 Parameter query

The DFS 600 is ready for operation and can be installed as in Section 7.

*The operating parameters can be reconfigured at any time in radar mode. To set a specific new operating parameter restart the setup procedure and the values will be shown one after the other if you repeatedly hold the magnetic key in place. With the value to be changed, the magnetic key must be held in place longer so that the selected number continues counting and can then be changed. Once the desired value is reached, remove the magnetic key again.*

### 6.3.4 Reset to factory settings

The factory settings can be restored in the DFS 600’s power up phase. To do this the magnetic contact must be held in place briefly during the system check in the power up phase (188 green, 188 red). When the factory settings have been restored, these will be shown in the display following the system check.

| Operating parameter | |
|---|---|
| Lower display threshold | 3 km/h |
| Upper display threshold | 199 km/h |
| Transition threshold | 50 km/h |
| Flash threshold | 75 km/h |
| km/h | - - (in green) |

# 7 Installation, assembly and operation

## 7.1 Preparation with optional accessories

### 7.1.1 Mains operation (constant power supply)

The power supply unit box (mains circuit) is for attachment to the back of the DFS 600 between the two C-rails.

(1) Hold the power supply unit box (Figure 7-1 Item 1) with its mounting plate (Figure 7-1 Item 4) vertically on the side (outside the pole area) of the DFS 600 on the two C-rails (Figure 7-1 Item 6).

(2) Hook the lower lug of the mounting plate into the lower C-rail.

(3) Insert the T-bolt (Figure 7-1 Item 5) into the upper C-rail and screw tight on to the DFS 600 with the hexagonal bolt (Figure 7-1 Item 2) and washer (Figure 7-1 Item 3).

Stick down both the cables on the DFS 600 with sellotape for transportation.

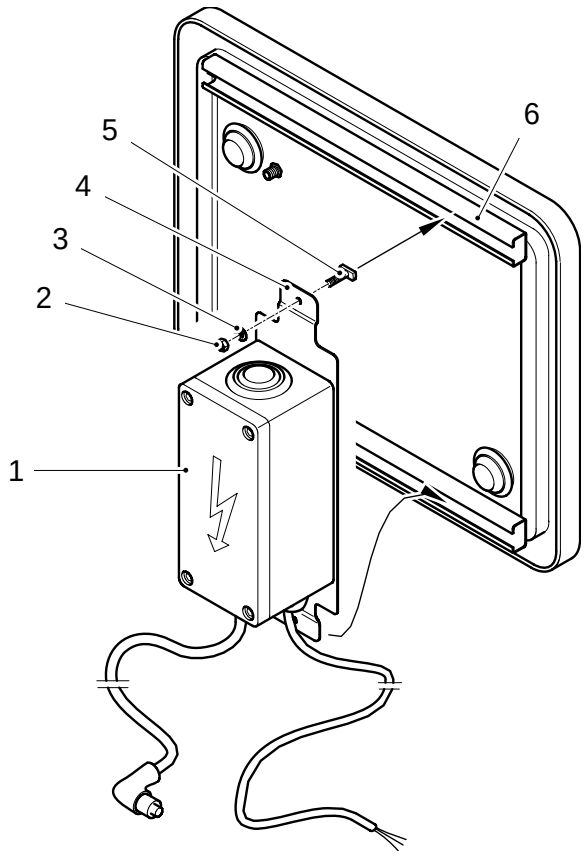



Figure 7-1 Mounting the power supply unit box

### 7.1.2 Battery buffer operation (interrupted power supply)

Mount the battery charger and battery in the battery box

(1) Bolt on the battery charger (Figure 7-2 Item 1) with the mounting plate (Figure 7-2 Item 2) of the charger mounting kit.

(2) Remove the blind stoppers from the back of the battery box and insert the cable holders (Figure 3-4 Item 12) and screw them tight.

(3) Screw the battery charger with the mounting plate to the back of the battery box (Figure 7-2 Item 3).

(4) Remove the mains plug from the mains cable (Figure 7-2 Item 4) of the battery charger and lay it in the back of the battery box with the cable holders.

*This work may only be carried out by a qualified electrician. See the safety instructions in Section 2. Risk of injury from electric shock with assembly by unqualified persons!*

(5) In order to prevent damage in transit, do not put the battery (Figure 7-2 Item 5) into the battery box until it is in its installation location.

(6) lock the battery box.

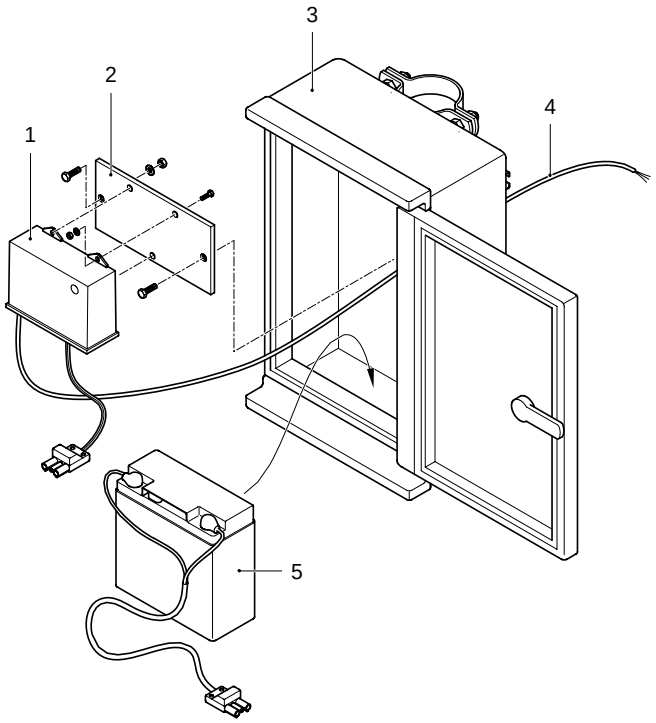



Figure 7-2 Installing the battery charger and battery in the battery box

### 7.1.3 Battery operation (no power supply)

(1) Put the battery (Figure 7-3 Item 1) into the battery box (Figure 7-3 Item 2) at the installation location.

(2) Connect the pre-installed battery cable (Figure 7-3 Item 3) to the battery.

(3) Lock the battery box.

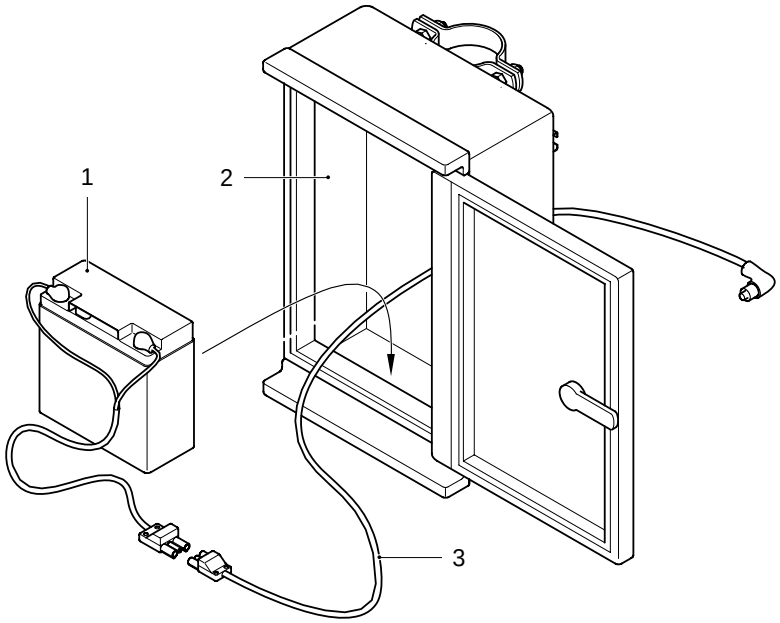



Figure 7-3 Putting the battery in the battery box

## 7.2 Selecting the installation location for DFS 600

To ensure correct measurements the location for the DFS 600 must be selected according to the following criteria:

- There must be an unobstructed visual field of at least 150 metres in front of the DFS 600. In this area and in the radar beam there must be no objects such as trees, poles, parking vehicles etc. Otherwise the speed display may be falsified and the radar range reduced. Trees, in particular reduce the radar range
- The location of the DFS 600 must be at least 65 metres away from large traffic signs. Otherwise these large traffic signs can reflect the radar beams such that the vehicles in the opposite lane could be recorded by the radar beam.
- Do not set the DFS 600 up directly at crossing intersections or bridges. The DFS 600 must be at least 125 metres away from crossing traffic, as it could otherwise also record the crossing traffic as oncoming vehicles

## 7.3 Installing the DFS 600

This section describes the assembly of the DFS 600 at the installation location.

NOTE *The safety instructions in Section 2 in particular are to be observed.*

*The installation location should be secured to prevent risks arising from flowing traffic. See Section 2 Safety instructions.*

*This work may in principle be performed by one person. No special tools are required for tightening the bolts.*

### 7.3.1 DFS 600 Montage

*A fixed pole checked for secure installation with a diameter of 60 mm and of the specified installation height must be installed at the location chosen for the DFS 600.*

*The DFS 600 must be set up for the chosen power supply:*

- *Fixed installation with constant power supply (mains operation). See Section 4.4.1: The power supply unit box is already fixed to the DFS 600.*
- *Fixed installation with battery and mains operation (battery buffer operation). See 4.4.2:*
  *The battery box with the battery charger and battery is bolted to the back of the DFS 600 after mounting on the pole. See Figure 3-4 Item 1.*
- *Installation independent of the mains (battery operation). See Section 4.4.3: The battery is in principle to be placed in the battery box bolted to the pole.*
  *If required, battery operation may also be used in areas without a battery box.*

(1) Unscrew the hexagonal nuts (Figure 7-4 Item 1) with their washers (Figure 7-4 Item 2) from the pipe cuffs supplied (Figure 7-4 Item 3) and dismantle the pipe cuffs.

(2) Bolt the mounting plate (Figure 7-4 Item 5) on the upper pipe cuff half to the plate bracket with two hex head bolts (Figure 7-4 Items 6) and hexagonal nuts (Figure 7-4 Item 8) with their washers (Figure 7-4 Item 7). Here the hex head bolts must be inserted into the mounting plate.

(3) Assemble the pipe cuff around the pole and bolt together loosely at the desired installation height.

(4) Hook the mounting plate (Figure 7-4 Item 5) of the upper pipe cuff into the upper C-rail (Figure 7-4 Item 10) on the DFS 600 (Figure 7-4 Item 9).

(5) Insert the two outward-pointing T-bolts (Figure 7-4 Item 11) on the lower pipe cuff half in the plate bracket and screw loosely with the hexagonal nuts (Figure 7-4 Item 8) and washers (Figure 7-4 Item 7). Assemble the lower pipe cuff around the pole and screw together lightly.

(6) Push the lower pipe cuff up to the height of the lower C-rail. Insert the T-bolts (Figure 7-4 Item 11) into the lower C-rail and screw together lightly.

*While the DFS 600 is still not firmly attached it should always be supported with one hand since it may otherwise slip to the bottom! There is a risk of injury!*

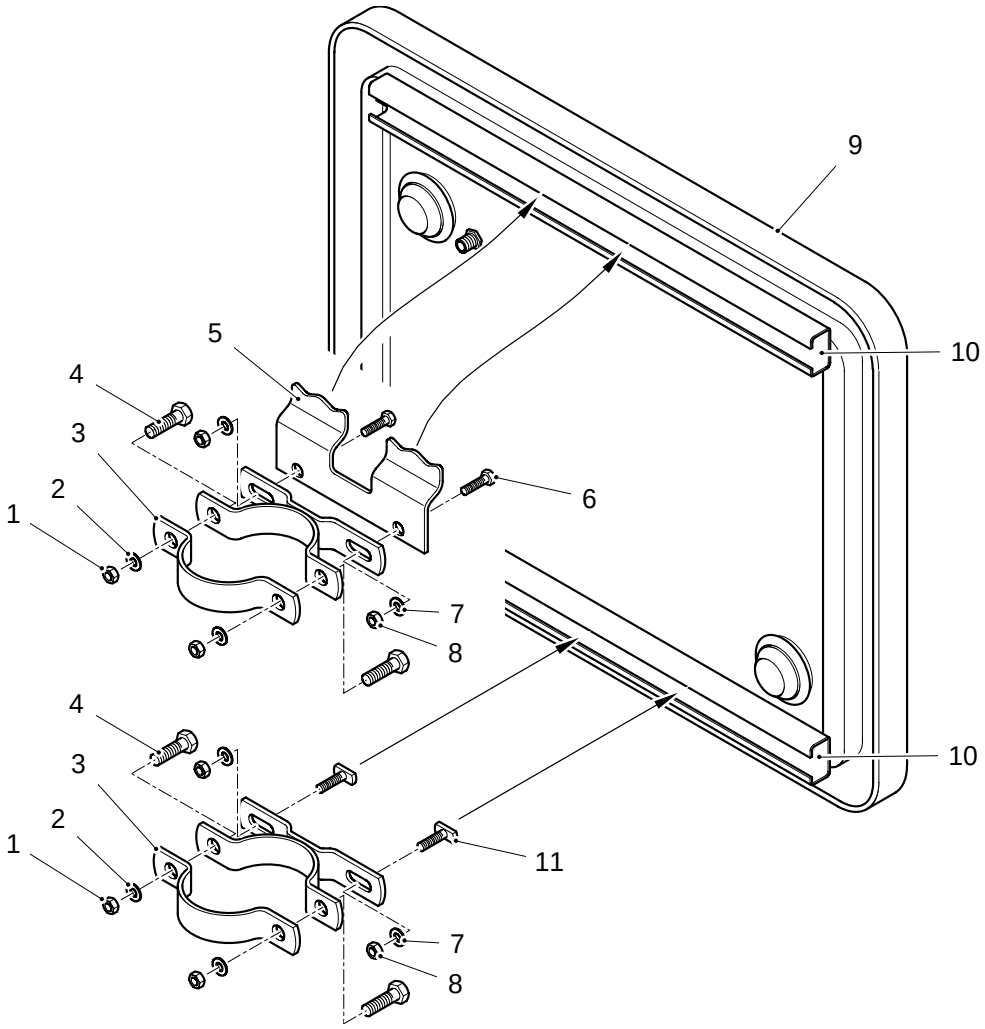



Figure 7-4 Mounting the DFS 600

(7) Position the DFS 600 vertically in the middle and swivel it horizontally until the cone of the radar beam is located above the lane to be monitored. See Figure 7-5. The maximum degree of horizontal swivel should be less than 10°.

(8) Tighten the cuff bolts. If necessary, secure the DFS 600 against slipping with a clamp on the tubular fixing or a bolt through it. In the event of longer installation time (after about 2 days) retighten the cuff bolts.

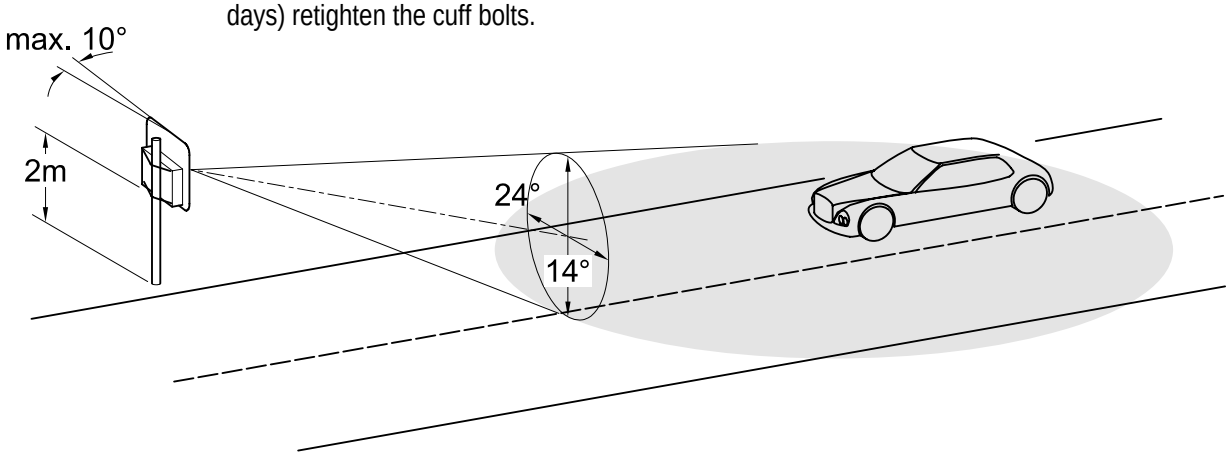



Figure 7-5 Directing the DFS 600 beside a road

(9) With fixed installation of the DFS 600 above a road (e.g. on a signal gantry), the DFS 600 must be positioned at a height of 4 to 6 metres centrally above the lane to be monitored. The fixing pole with the mounted DFS 600 must be capable of being tilted vertically in order to direct the DFS 600 at the lane.

Swivel the DFS 600 vertically in such a way that the cone of the radar beam is located above the lane to be monitored. See Figure 7-6. The angle of vertical swivel should be between 6° and 8°.

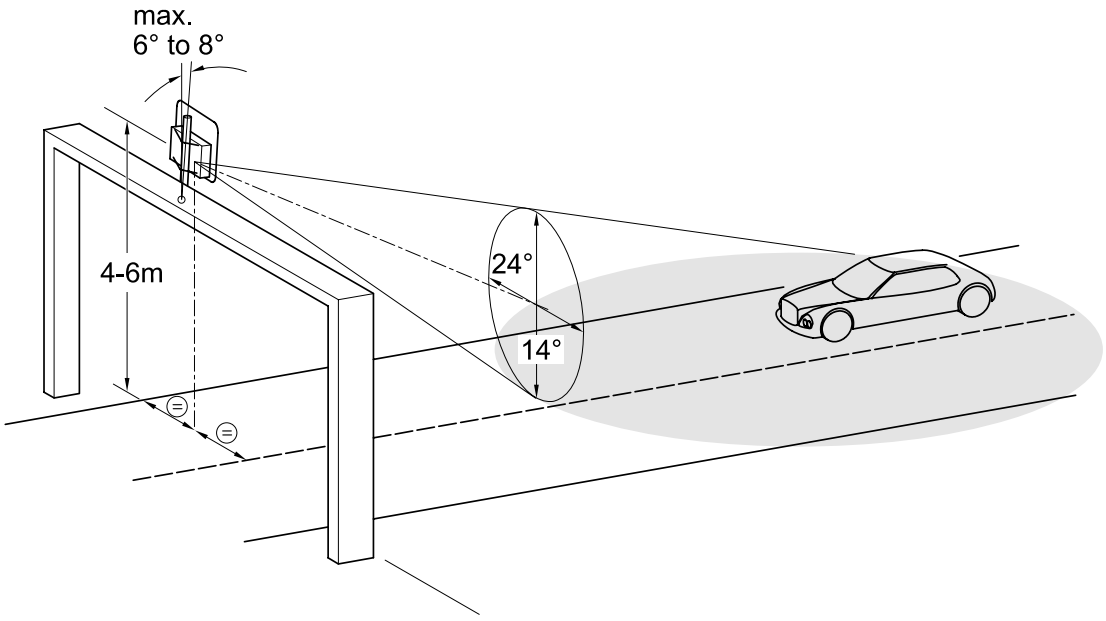



Figure 7-6 Directing the DFS 600 above a road

### 7.3.2 Reflective signboard (optional accessory)

The reflective signboard is attached and fixed above the DFS 600 with two EKS cuffs.

(1) Unscrew both the EKS cuffs Figure 7-7 Item 1) and insert the clamping strips of the EKS cuffs in the rear crossbars of the signboard.

NOTE *Make sure here that the clamping strip of the upper EKS cuff points upwards and the clamping strip of the lower EKS cuff points downwards.*

(2) Attach the reflective signboard to the pole and screw the EKS cuffs together loosely.

(3) Orientate the reflective signboard and bolt the cuffs tightly to the pole.

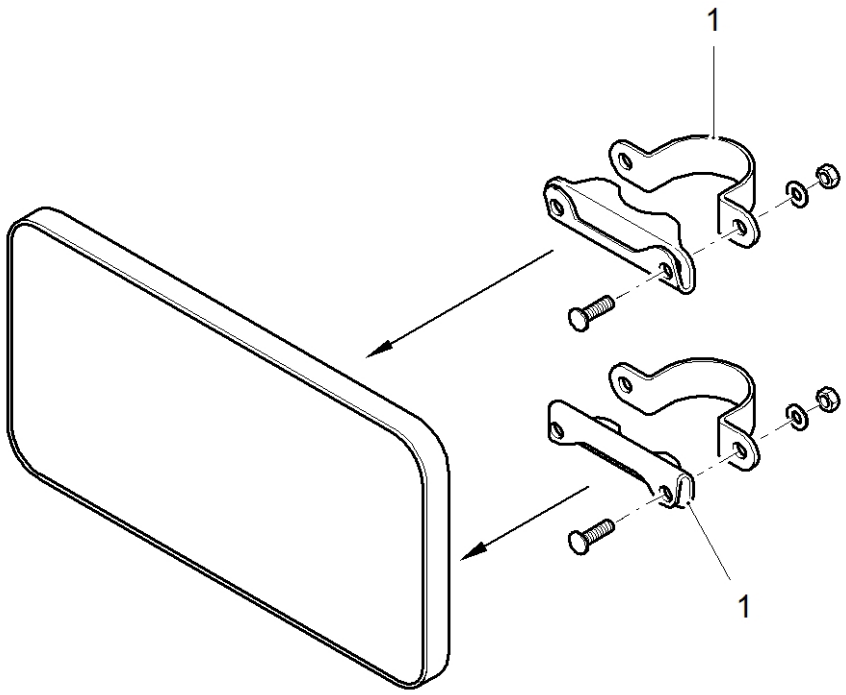



Figure 7-7 Reflective signboard

## 7.4 Making the electrical connections

Depending on the additional electrical equipment, the following power supply connections are possible with the DFS 600:

- Fixed installation with constant power supply (mains operation), see Section 4.4.1:
  Power supply via a 230 V power connection box (power unit).
- Fixed installation with battery and mains operation (battery buffer operation), see 4.4.2:
  Power supply via a 230 V power connection (battery charger) and
  12V battery (both built into a battery box), see Figure 3-4 Item 1.
- Installation independently of the mains (battery operation), see Section 4.4.3:
  Power supply via a 12 V battery.

If the power supply to the DFS 600 has been connected, then the DFS 600 power up process starts with an automatically-run system check that is shown in the numerical display by two bars "- -" that flash alternately red and green.

If the voltage to the DFS 600 is too high or too low, then the unit switches off immediately.

After the system check has run, the DFS 600 is ready to operate. The operating parameters must be set in advance in accordance with Section 6.3.

NOTE *When connecting to the mains, the following is to be observed in particular:*

*To connect the DFS 600 to the public power supply outdoors, a connection must be available that satisfies the local electrical guidelines and safety requirements.*

*The power supply line phase [brown/black wire] must be secured with a suitable fuse, typically 4 to 6 A. Otherwise the electronics in the DFS 600 may be damaged or destroyed in case of over-current.*

*When the DFS 600 is in a fixed installation, e.g. to street lights, a disconnectable over-current protective device (max. 6A) according to EN60950 must be installed between the power supply line and the DFS 600. For service work on the DFS 600 the power supply must be disconnected via the over-current protective device.*

*The over-current protective device is to be installed in accordance with the local electrical guidelines and safety requirements. Therefore in Scandinavia, for example, a cut out must have a 2-pole connection against grounding.*

*The electrical connections must always be produced in accordance with the requirements for the intended location. In the case of fixed installations the plug on the power supply unit or the Charger may have to be removed. If the plug is still to be used, then an adequately waterproof, weather-resistant, and properly mounted socket with protection to the power line as specified above is to be provided.*

*Pay particular attention to further safety advices specified in Section 2.*

*For compliance with CE Regulations for fixed installations, where the Charger is connected to the public mains network, a frequency filter has to be used in the supply line. Following types can be used:*

*1. Schurter 5500.2034 FMLB-0109-2040*

*2. Schurter 5500.2043 FMW2-52-2/1.25*

### 7.4.1 Mains operation (constant power supply)

*The power connection unit box should in principle be attached to the DFS 600 but it can be installed separately!*

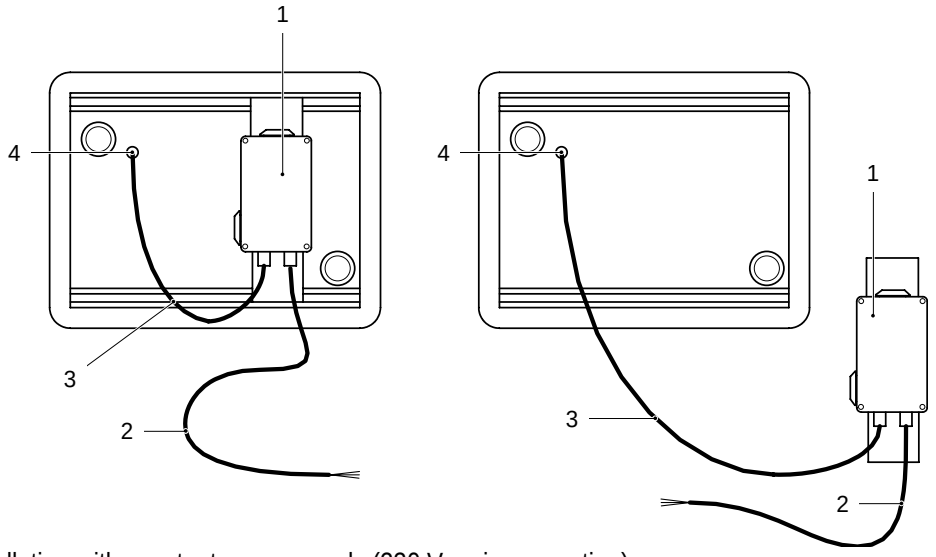



Figure 7-8 Fixed installation with constant power supply (230 V mains operation)

(1) Insert the M12 plug of the DFS 600 connector cable (Figure 7-8 Item 3) from the power supply unit box (Figure 7-8 Item 1) into the connection socket (Figure 7-8 Item 4) on the back of the DFS 600 and screw tight.

(2) Connect the mains cable (Figure 7-8 Item 2) to the mains. The DFS 600 is now powered up.

(3) Perform a functional test of the display with a hand movement.

### 7.4.2 Battery buffer operation (interrupted power supply)

*The 230 V battery charger and the 12 V battery must be built into the battery box (Figure 7-9 Item 2).*

(1) Insert the battery cable from the battery charger (Figure 7-9 Item 4) and that from the battery (Figure 7-9 Item 8) into the two plugs with one cable feed each on the branched cable (Figure 7-9 Item 5).

(2) Insert the pre-installed DFS 600 connector cable (Figure 7-9 Item 6) into the cable connector with two cable feeds.

(3) Insert the M12 plug of the DFS 600 connector cable into the connection socket (Figure 7-9 Item 7) on the back of the DFS 600 and screw it tight.

(4) Connect the mains cable (Figure 7-9 Item 1) from the battery charger (Figure 7-9 Item 3) to the mains – the DFS 600 is now powered up.

(5) Perform a functional test of the display with a hand movement.

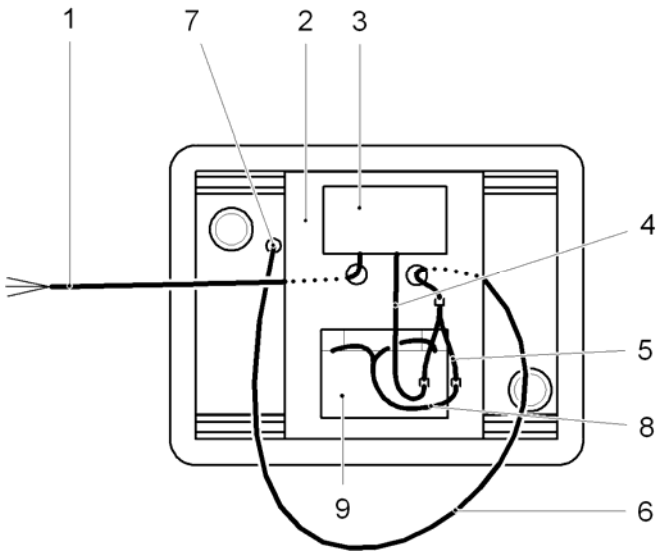



Figure 7-9 Fixed installation with battery and mains operation

### 7.4.3 Battery operation (no mains supply)

(1) Insert the DFS 600 connector cable (Figure 7-10 Item 2) in the battery cable (Figure 7-10 Item 3) of the battery (Figure 7-10 Item 4).

(2) Insert the M12 plug of the DFS 600 connector cable into the connection socket (Figure 7-10 Item 4) on the back of the DFS 600 and screw it tight – the DFS 600 is now powered up.

(3) Perform a functional test of the display with a hand movement.

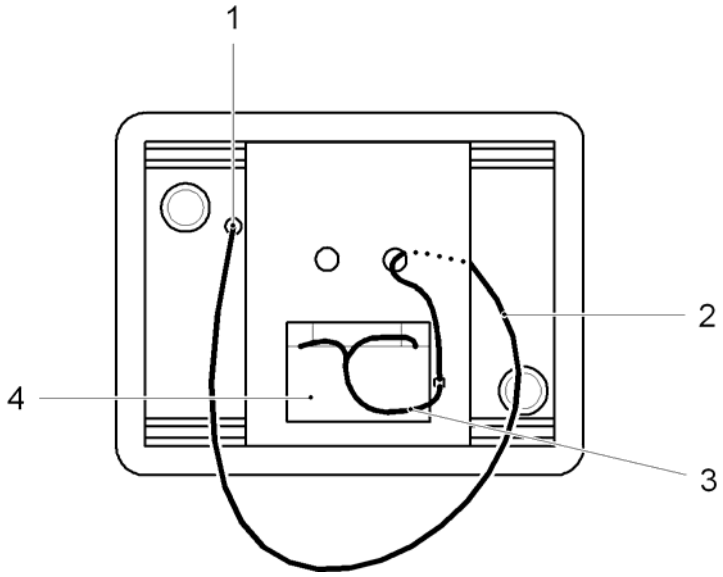



Figure 7-10 Power supply with a 12 V battery

### 7.4.4 Battery operation inside

(1) Insert the optional DFS 600 connector cable (Figure 7-11 Item 3) in the connector cable (Figure 7-11 Item 2) of the battery (Figure 7-11 Item 1).

(2) Insert the M12 plug of the DFS 600 connector cable into the connection socket (Figure 7-11 Item 4) on the back of the DFS 600 and screw it tight – the DFS 600 is now powered up.

(3) Perform a functional test of the display with a hand movement.

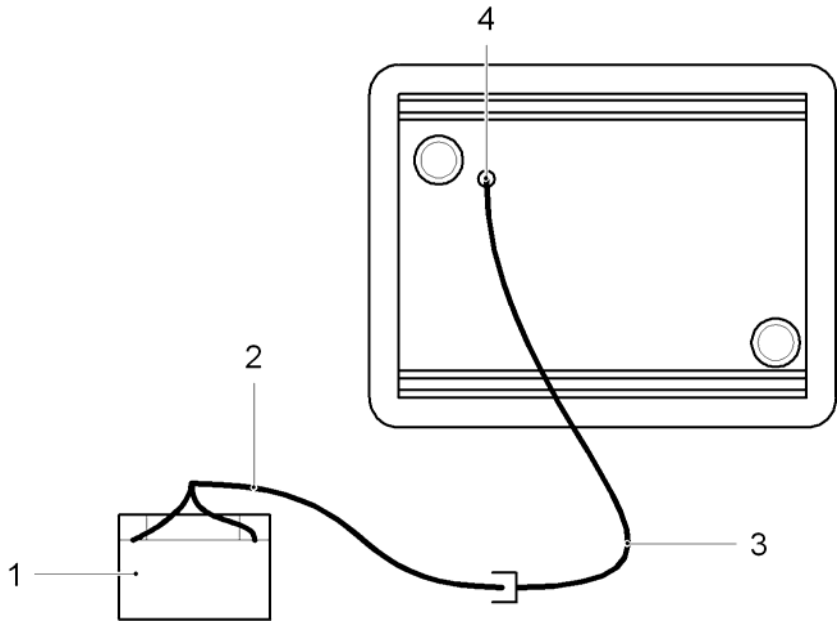



Figure 7-11 Installation independently of the mains inside (battery operation)

# 8 Service and Maintenance

## 8.1 Cleaning

(1) Clean the speed display and the reflective front of the frame with a clean, dry cloth

NOTE *The use of aggressive detergents and abrasives can damage the reflective coating and should therefore be avoided!*

(2) Clean all air vents on the DFS 600 outside and inside with a cloth or a broom. The air supply vents must always be kept uncovered.

(3) Clean rough dirt from the DFS 600 with a broom.

## 8.2 Maintenance

The DFS 600 is maintenance-free as a basic principle.

Before setting it up, subject the equipment to a visual inspection and, while doing so, pay particular attention to the condition of the mains cables. These must not be damaged but, if they are, have the cable replaced by a qualified electrician.

If Batteries are used, check that their external condition is perfect in advance. In case of damage, replace the Battery.

*When handling batteries pay particular attention to further safety advices as specified in Section 2. Risk of injury as a result of leaking liquid exists!*

When replacing components only original 3M parts should be used. The manufacturer's warranty expires if components from other manufacturers are used.

The electrical connection components such as plugs, sockets, cables, etc., are standard commercial electrical goods which can be replaced by a qualified electrician.

## 8.3 Symptom / solution table

Possible defects and unexpected behaviour of the DFS 600 can be limited and corrected using the symptom / solution table shown below.

Problems and errors that the operator cannot localize and correct using this table should be communicated to the dealer or to the local 3M customer care services.

| Symptom | Possible cause | Solution |
|---|---|---|
| DFS 600 does not show any reaction | No power to DFS 600 | Check power supply |
| | Wrong operation parameters are chosen | Check operation parameters |
| Display visibility reduced | Dew on the sign | Dry the sign and use anti dew if applicable.<br>Check if the vents are open |
| | Retroreflective sheeting is dirty or damaged | Clean or replace sheeting |
| | Wrong cleaning of the retroreflective sheeting | Clean sheeting only with soft detergent |
| Battery is not charged again | Battery charger is not installed | Check connection to battery charger |
| | Battery and charger is not connected correctly | Check installation of battery charger and battery |
| | Power temporarily not available (e.g. street lamp) | Check power supply |
| | Damaged cable of the battery or charger | Check cable and connector and replace as necessary cable |
| Battery empty in less than 3 days | Very high volume of traffic | Charge battery / change battery |
| | Battery damaged (old) | Change battery |
| No speed values are displayed | DFS 600 is switched off | Connect power supply |
| | Cables of power supply are not correctly connected | Check power supply connection |
| | No power to DFS 600 | Check power supply |
| | Speed range in the configuration parameters is wrongly chosen | New setup of the speed range settings in the configuration parameters |

| Symptom | Possible cause | Solution |
|---|---|---|
| | LED module damaged | Make system check |
| | Wrong alignment of the DFS 600 towards the road | Align DFS 600 correct to the road |
| Incorrect speed values are displayed | Large objects reflecting the radar waves | Check location and the alignment of the DFS 600 |
| | DFS 600 is not aimed correctly | Check location and the alignment of the DFS 600 |
| Display brightness is very low | Sensor is dirty / masked | Clean sensor |
| Battery box cannot be closed | Rubber seal has slipped | Check rubber seal on your battery box |
| | Cables are between the rubber seal and door | Check for cables which could be hanging outside of the battery box |
| | Wrong key | Check number of key |
| Water in the battery box | Rubber seals not tight | Check rubber seals |
| | Formation of condensed water | Check and clean the air vents |

# 9 Technical Data

## DFS 600 - Complete system

- Dimensions in mm .....610 wide x 480 high x 58 deep
- Weight .....4,0 kg

## Speed-display device

- Line voltage .....11,3 V – 14,7 V
- Electrical power
  - Without display operation .....840 mW
  - Maximal .....24 W
- Case ingress protection .....IP 54
- Permissible ambient temperature ..... -20 to +80 °C
- Permissible humidity ..... up to 95%
- Digital display ..... 330 mm high, 450 mm wide
  - .....2 1/2-digital display with 12 segments, highest displayable value: 19
- LEDs ..... InGaAlP SMD LEDs
  - Viewing angle 16° to 18°
  - 3 rows green LEDs (570 mm)
  - 3 rows red LEDs (635 mm)
- Radar frequency .....24,15 GHz - 24,25 GHz
- Radar output .....20 dBm, 100 mW
- Radar speed-measurement range .....3 km/h to 199 km/h
- Radar speed-measurement tolerance
  - ± 2 km/h for speeds under 100 km/h
  - ± 2% km/h for speeds over 100 km/h
- Radar distance range .....approx. 100 m for a passenger car
- Angle of radar beam .....24° horizontal, 14° vertical
- Reflective coating ..... DG$^3$ white

### Reflective signboard

- Dimensions in mm ..... 598 wide x 300 high
- Reflective coating ..... DG³ white

### Power Supply Unit Box (optional equipment)

- Input ..... 100 V - 240 VAC @ 50 - 60 Hz, Protection Class 1
- Output ..... 12 V/100 W
- Ingress protection ..... IP 55
- Weight ..... approx. 2,0 kg
- Permissible ambient temperature ..... -20 to +60 °C

### Battery (optional equipment)

- Electrical output ..... 12 V, 17 Ah
- Standby-Zeit ..... up to 240 hours after full charging and few traffic
- Weight ..... approx. 6,0 kg
- Permissible ambient temperature ..... -15 to +50 °C

### Battery Charger (optional equipment)

- Eingang ..... 100 V - 240 VAC @ 50 - 60 Hz, Schutzklasse 2
- Ausgang ..... max. 12 V/60 W
- Schutzart ..... IP 67
- Permissible ambient temperature ..... - 40° to + 40°
- Weight ..... approx. 1,0 kg

### Battery Box (optional equipment)

- Suitable tube diameter for mounting ..... 60 mm
- Weight, empty ..... 2,5 kg