Humidity sensors - FG80...

and combined

Humidity-temperature sensors - TFG80...

with ”Polyga®” humidity measuring element for the measurement of relative air humidity and temperature - for rooms and air channels.

FG80...
TFG80...

Model overview

passive sensors

FG80H	**Humidity Sensor** with resistance output up to 10k ohms
TFG80H	**Humidity-temperature Sensor** with resistance output up to 10k ohms

active sensors

FG80J	**Humidity Sensor** 0(4)...20mA or 0...10V DC for U=15...30V DC
TFG80J	**Humidity-temperature Sensor** each 0(4)...20mA or 0...10V DC for U=15...30V DC
FG80AC	**Humidity Sensor** each 0(4)...20mA or 0...10V DC for U=24V AC
TFG80AC	**Humidity-temperature Sensor** each 0(4)...20mA or 0...10V DC for U=24V AC

Description of the sensor :

The ”PolygaPolyga®” humidity measuring element consists of several synthetic fabric bands each with 90 individual fibres with a diameter of 3 µm each. In their untreated state, the synthetic fibres are not hygroscopic - their hygroscopic properties are acquired by means of a special process which allows the synthetic fibres to absorb moisture. The molecular structure of the individual fibres is arranged lengthways. When water is absorbed, the molecular chains alter, the outward result being a change in length. A loss of water has a converse effect on the fibre. If the fibre is in equilibrium with the air humidity, there is neither absorption nor a loss of water. The length at this point serves as a gauge for the relative humidity.
If the measuring element is exposed to an air humidity of 100%rh, a film of water forms on the surface of the element (dew point). The physical effect is one as if the measuring element had been immersed in water. The measuring element is saturated. An ideal fixed point is thus attained for adjusting or controlling the sensors. The measuring element is waterresistant. Once administered to the Galltec® measuring element, the hygroscopic properties remain stable, the sensitivity remaining until it becomes destroyed by extraneous influences. Regeneration as with fine-measuring elements is not necessary, but does not cause any harm.

Design of the sensor

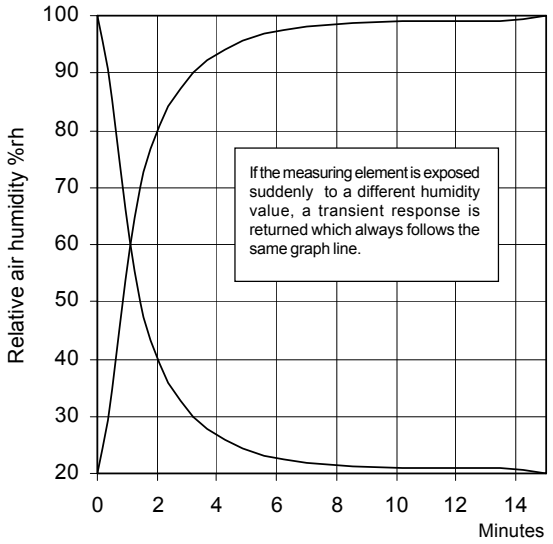
The expanding action (predominantly lengthways) of the fibres is picked up by means of an electronic sensing system and converted by integrated signal preprocessing into standardised signals **0..20mA or 4..20mA or 0...10V**.

The fan-shaped measuring element, which faces outward from the housing, is protected by a perforated sensor tube. The sensors are designed for pressureless systems. The unit should be installed in a location where condensation cannot enter into the housing. A preferred position would be ”sensor vertically down” or ”sensor horizontal”. In these positions, a cover plate with a 0.8 mm diameter hole will prevent water from entering.
The TFG80 range of sensors have built-in temperature sensors (mainly Pt100) for simultaneous measurement of temperature. Temperature readings are converted likewise into standardised signals **0..20mA or 4..20mA or 0..10V**.

Ageing
In order to maintain their long-term stability, it is important that the measuring elements undergo a special ageing process, details of which cannot be given here.

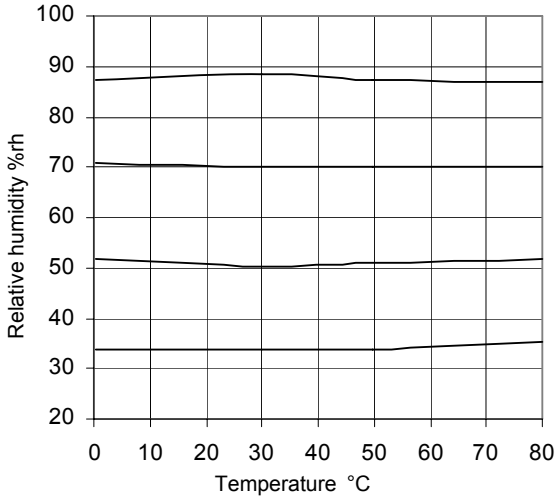
Reaction of the sensor
Due to the law of diffusion, there is a time delay before the fibres are saturated during water absorption. This is a decisive factor when determining the reaction time. Thus, for one individual fibre with a diameter of 3 µm, a short saturation time (several seconds) can be measured. Empirical investigations show that bundled or woven fibres, as are used here in the Galltec® sensor, give rise to a longer period prior to saturation. This is because the individual fibres impede each other during water absorption and/or water loss, and the ensuing humidity does not register until later. Measurements have shown that, at a wind speed of 2m / sec. the half-life period is 1.2 mins. This represents an effective period of approx. 30 - 40 mins.

Half-life period



Transient response of the measuring element between 20 and 100% rh.

Thermal behaviour



80º C is given as the maximum temperature value. Higher temperatures can only be tolerated for a short period of time. The eventual result is a change in the molecular structure which causes a constant error. The maximum temperature of 80º C only applies, however, if no harmful substances (acids, solvents etc.) are present in the medium.

Technical data
Physical data

humidity measuring range ..... 0...100%rh
measuring accuracy
... >40%rh ..... ±2.5%rh
...<40%rh .. according to tolerance diagram
working range ..... 30...100%rh
temperature working range ..... -30...+80ºC
measuring accuracy ..... ±0.5ºC
measuring medium ..... air, pressureless, non-aggressive
permissible ambient temperature at the housing ..... -20...60ºC
at the sensor ..... -40...+80ºC
mean temperature coefficient .....-0.1%/K at 20ºC and 50%rh
adjustment ..... at average air pressure 430m NN
permissible air speed 8m/sec
with protective gauze (order no. 20.014) 15m/sec
half-life period at v=2m/sec.....1.2 min
sensor length ; sensor material ..... 220mm; high-grade steel
fixing ..... slots in housing base for channel mounting
(order no. 20.009) ..... console for wall mounting
mounting position ... sensor vertically downwards, or horizontal
connecting terminals ..... for conductor cross sections 0.5mm²
cable connection ..... by twist nipple M20x1,5
electromagnetic compatibility
resistance to interference ..... EN 50 082-2
interference emission ..... EN 50 081-2
housing ..... ABS
protective system IP64
weight ..... ca 0.4 kg

Electrical data for passive sensors

Humidity Output 1 ..... 0...100 ohm linear 2-wire
..... 0...200 ohm linear 2-wire
..... 0...1000 ohm linear 2-wire
..... 100...138.5 ohm linear 2-wire
.....5..100..5 ohm unlinear 3-wire
further resistance ranges on request
permissible load ..... 1.0 watt
max. voltage 42V
insulation resistance ..... 10 Mohm

Temperature Output 2 (TFG80H) ..... Pt100 ref. DIN EN 60751
permissible load for air 1m/sec and t=0.1K ..... 2 mA

Electrical data for active sensors

Humidity Output 1 ..... 0...20mA or 0...10V 4-wire system
.... or 4...20mA ..... 2-wire system (only with DC)
Temperature Output 2 ..... 0...20mA or 0..10V 4-wire system
... or 4...20mA ..... 2-wire system (only with DC)
operating voltage ..... 15...30V DC or 24V AC ± 10 %
max. load for current output ..... 500 ohms
min. ballast resistance for voltage output .....10k ohms
internal consumption per range ..... 5 mA, DC version
internal consumption per range .....10 mA, AC version
temperature measuring range ..... see table
linearity distortion of the temperature output ..... <0.5%
”subject to technical modifications”

Type	Humidity		Temperature		Operating valtage	Conductor-system	Order No
	Measuring range 1	Output 1	Measuring range 2	Output 2			

Overview of *passive* sensors

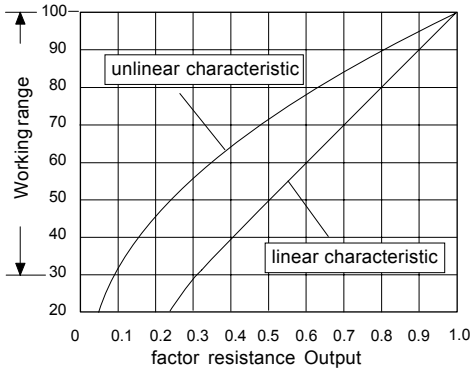
FG80H	0...100%rh	0...100 Ohm			max 42V	2-pin	44010100
	0...100%rh	0...200 Ohm			max 42V	2-pin	44010200
	0...100%rh	0...1000 Ohm			max 42V	2-pin	44010300
	0...100%rh	100...138,5 Ohm			max 42V	2-pin	44010400
	0...100%rh	5...100...5 Ohm			max 42V	3-pin	44010600
TFG80H	0...100%rh	0...100 Ohm	+5...+80°C	Pt100	max 42V	2-pin	44700150
	0...100%rh	0...200 Ohm	+5...+80°C	Pt100	max 42V	2-pin	44700250
	0...100%rh	0...1000 Ohm	+5...+80°C	Pt100	max 42V	2-pin	44700350
	0...100%rh	100...138,5 Ohm	+5...+80°C	Pt100	max 42V	2-pin	44700450
	0...100%rh	5...100...5 Ohm	+5...+80°C	Pt100	max 42V	3-pin	44700650

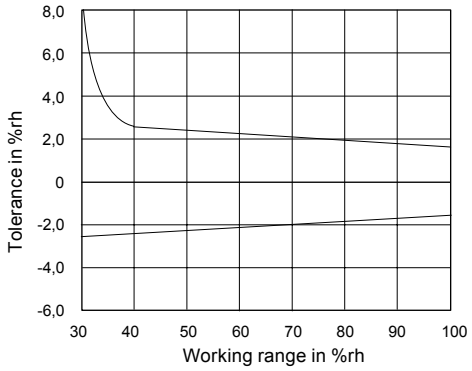
Overview of *active* sensors U = 15...30V DC and/or 24V AC (20...28V AC)

FG80J	0...100%rh	0...20mA			15...30VDC	3/4-wire	44013000
FG80AC	0...100%rh	0...20mA			24VAC	3/4-wire	44014200
	0...100%rh	0...10VDC			15...30VDC 24VAC	3/4-wire	44014700
	0...100%rh	4...20mA			15...30VDC	2-wire	44014800
TFG80J	0...100%rh	0...20mA	0...+40°C	0...20mA	15...30VDC	3/4-wire	44513030
TFG80AC	0...100%rh	0...20mA	-30...+60°C	0...20mA	15...30VDC	3/4-wire	44573030
	0...100%rh	0...20mA	-10...+90°C**	0...20mA	15...30VDC	3/4-wire	44623030
	0...100%rh	0...20mA	0...100°C*	0...20mA	15...30VDC	3/4-wire	44543030
	0...100%rh	0...20mA	0...+40°C	0...20mA	24VAC	4-wire	44514242
	0...100%rh	0...20mA	-30...+60°C	0...20mA	24VAC	4-wire	44574242
	0...100%rh	0...20mA	-10...+90°C	0...20mA	24VAC	4-wire	44624242
	0...100%rh	0...20mA	0...100°C*	0...20mA	24VAC	4-wire	44544242
	0...100%rh	0...10VDC	0...+40°C	0...10VDC	15...30VDC 24VAC	3/4-wire	44514747
	0...100%rh	0...10VDC	-30...+60°C	0...10VDC	15...30VDC 24VAC	3/4-wire	44574747
	0...100%rh	0...10VDC	-10...+90°C	0...10VDC	15...30VDC 24VAC	3/4-wire	44624747
	0...100%rh	0...10VDC	0...100°C*	0...10VDC	15...30VDC 24VAC	3/4-wire	44544747
	0...100%rh	4...20mA	0...+40°C	4...20mA	15...30VDC	2-wire	44514848
	0...100%rh	4...20mA	-30...+60°C	4...20mA	15...30VDC	2-wire	44574848
	0...100%rh	4...20mA	-10...+90°C	4...20mA	15...30VDC	2-wire	44624848
	0...100%rh	4...20mA	0...100°C*	4...20mA	15...30VDC	2-wire	44544848
Speciality	0...100%rh	0...20mA	Pt100	resistance	15...30VDC	3/4-wire	44703050
FG80JPt100	0...100%rh	0...10VDC	Pt100	resistance	15...30VDC 24VAC	3/4-wire	44704750
	0...100%rh	4...20mA	Pt100	resistance	15...30VDC	2-wire	44704850

* heed max. temperature range ** suitable for EDJ regulator

Humidity and tolerance diagram



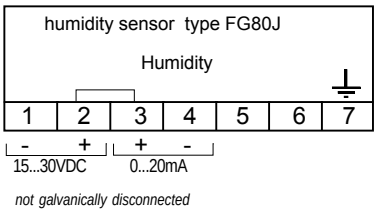


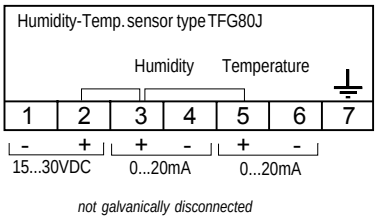
Connection diagram for passive sensors with resistance output

Connection diagram for active sensor U =15...30V DC

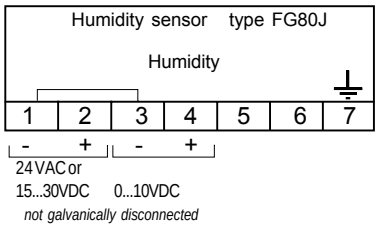
EMV information: use shielded signalling lines and earth the shielding !

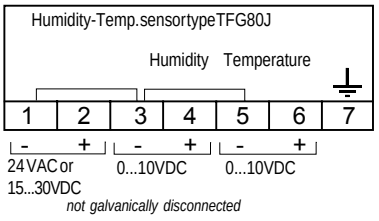
4-wire system



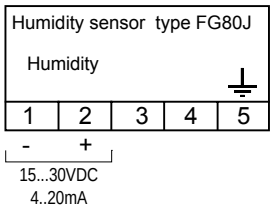


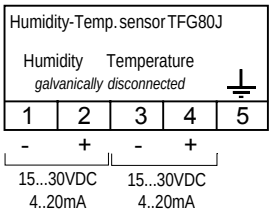
3/4-wire system





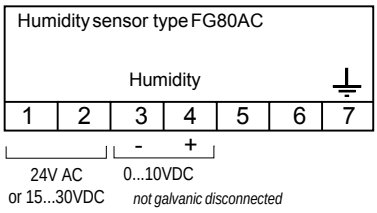
2-wire system

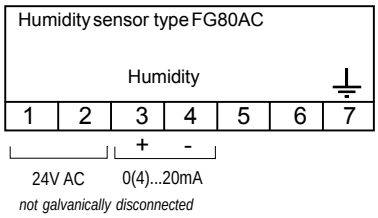


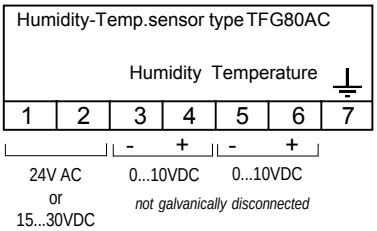


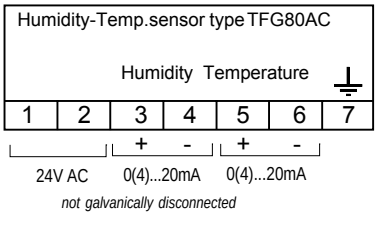
Connection diagram for active sensors U_B=24V AC (± 10 %)

EMV information: use shielded signalling lines and earth the shielding !





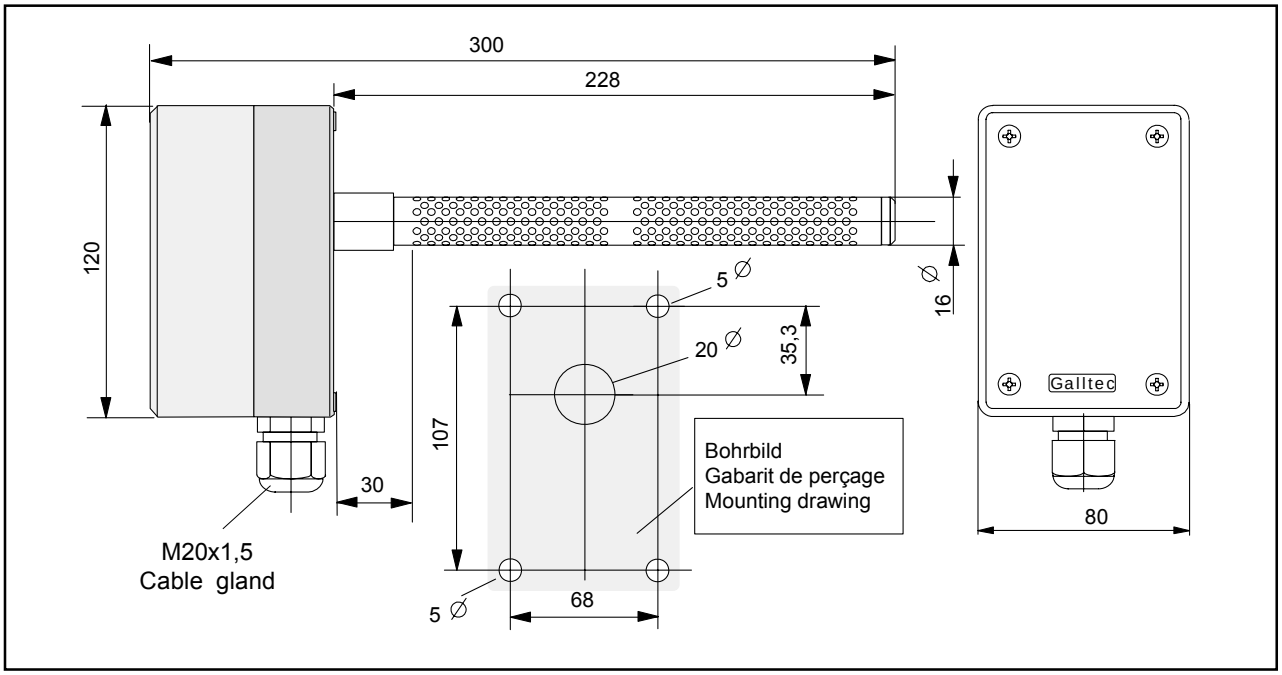




Information for voltage output and 3-wire connection

Internal consumption of the sensor from circa 15...25 mA causes a voltage drop on the supply lines. If the measuring signal is taken from terminal 4 / terminal 6 to the connecting point at the power supply (three-wire circuit), then an additional measuring error is incurred, dependant upon the circuit length. A 4-wire connection is recommended.

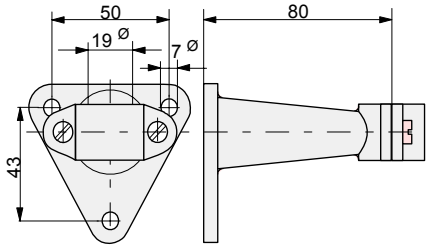
Dimensions diagram



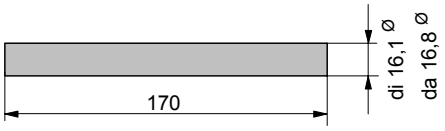
Accessories

Canvas blind for exterior assembly without solar cell Item No. 20.024
with solar cell Item No. 20.025

Console for wall mounting Item No. 20.009

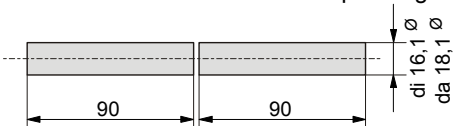


Gauze protector Item No. 20.014
recommended for air speeds between 8 and 15 m/s

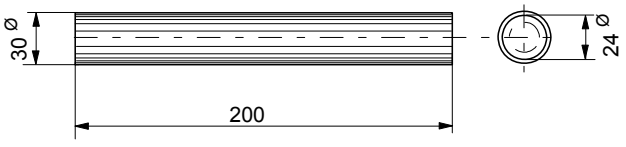


Ventilated sensor tube
for improved air flow
Item No. 20.022

PTFE filter, two-part, Item No. 23.063
recommended for extreme operating conditions



Protector tube for external mounting
without ventilating fan, Item No. 20.011



Important The air's capacity to absorb water is influenced among other factors by the temperature. This is a physical law (identified in the *hx* diagram of Mollier). The higher the air temperature, the larger the amount of steam that can be absorbed up to saturation point (100%rh). If a sensor is calibrated under varying air temperature conditions, the result is an irregular, unhomogenous measuring medium which automatically gives calibration errors. The table below shows the influence of the air temperature on air humidity. If, for example, calibration occurs at an air temperature of 20ºC and 50%rh and a varying temperature range of only +/-1 ºK, this results in a variation in humidity of the measuring medium (air) of +/-3.2%rh.

	10°C	20°C	30°C	50°C
10%rh	+/-0,7%rh	+/-0,6%rh	+/-0,6%rh	+/-0,5%rh
50%rh	+/-3,5%rh	+/-3,2%rh	+/-3,0%rh	+/-2,6%rh
90%rh	+/-6,3%rh	+/-5,7%rh	+/-5,4%rh	+/-4,6%rh

Physical influence of air temperature on air humidity

Calibration

Galltec® sensors are adjusted correctly at a room temperature of 23ºC and 50%rh at a mean air pressure corresponding to 430m NN. If, however, a further adjustment is necessary, the following procedure should be adhered to :

- Ensure that the ambient humidity as well as the ambient temperature are constant.
- If possible, use a psychrometer for testing, (do not use testing equipment with capacitive sensors).
- Leave the equipment to be tested for *a minimum of 1 hour under **constant** test conditions*.
- All Galltec® sensors are equipped with an adjustment facility. In most cases this involves an adjuster screw fixed with screw securing lacquer. When the lacquer is removed the screw can be adjusted. After calibration, the adjuster screw should again be secured.

Maintenance - Instructions for use - Effect of pollutants

The measuring element is maintenance free when the surrounding air is clean. Agents that are corrosive and contain solvents, depending upon the type and concentration of the agent, can result in faulty measurements and cause the measuring element to break down. Direct sunlight should be avoided. Substances deposited on the sensor are damaging as they eventually form a water-repellent film (this applies to all humidity sensors with hygroscopic measuring elements). Such substances are resin aerosols, lacquer aerosols, smoke deposits etc. The water-resistant property of the Galltec® sensors allows for cleaning using water. Solvents cannot be used for this purpose. A light-duty detergent is recommended. Any detergent residue should, however, always be thoroughly washed out.
A special process ensures that Galltec® sensors have good long-term stability. Regeneration is not necessary, but is also not harmful.

The temperature coefficient as well as the self-heating may vary according to the location and the application (especially with sensors where electronic and measuring system are integrated in one housing).

WARNING The guarantee is no longer valid if the interior of the measuring element has been accessed.

Guide to installation

Interference is often to be encountered during installation. The correct installation procedure can prevent interference to a very large extent. However, some ground rules should be observed.
To avoid interference, suppression should be carried out in accordance with VDE 0875 and VDE 0874
(*VDE* - this is assumed to be the *Vorschriftenwerk Deutscher Elektrotechniker* - regulations governing German electrical engineers*).*
Fundamentally, interference must be removed at its source, where suppressor material is most effective. Interference can, however, also result from electromagnetic fields via signalling lines. The EMV law determines the corresponding protective measures. All Galltec® equipment is designed in accordance with European standards EN 50081-2 and EN 50082-2 (for industrial locations). In addition, further protective measures must be observed.

Unavoidable sources of interference should be kept at a good distance from the control systems.

Data and signalling lines should not be used in parallel with control, networking and power lines.

For data and signalling lines, shielded cable should be used, and the shielding must be applied to the earth terminal. Ensure that earth circuits and fault currents do not arise as a result of a second earth connection.

For equipment with a network connection, it is recommended that a separate network circuit be used.

During the switch process, electrical power consumers such as switch contactors, magnetic valves etc. produce induction voltages that can cause interference. In the trade there is an abundance of protective and suppressor component parts that are most effective when applied directly to the source of the trouble. A suitable suppressor has the added advantage that components such as relays, microswitches etc. have a longer service life.

Further difficulties during installation can arise if signalling lines are joined together with common lines. It is essential to check whether this is permissible. Interference is particularly likely when installing using equipment of different makes. Here, too, the trade offers isolating amplifiers that overcome the problem.