



Inspired by **temperature**

**Electromagnetic
Compatibility
(EMC)**

Technical Bulletin

huber

Electromagnetic Compatibility

(EMC)

Foreword

Dear customer,

Huber temperature control units comply with basic EMC requirements. Environmental conditions of the place of installation and the compilation of a system, have a direct influence on the EMC behavior of a device. Ensure “EMC-compliant” installations and setups to comply with EMC requirements.

This document and the following instructions are intended to assist the user in meeting such requirements.

1 Information on EMC-compliant installations

1.1 General basic rules to ensure EMC

- All ground or ground/potential connections must cover a large area to effectively protect against low and high-frequency EMC interferences.
- Wires and wiring must be EMC-compliant.
- Potential differences must be avoided by the proper selection and implementation of a suitable grounding/earthing concept.
- Appliances are generally required to have sufficient immunity and only minimal transient emissions. Limits are defined in relevant standards.
- The responsible body must ensure that the installation complies with the national laws and the regulations for an electromagnetically compatible installation.

2 EMC environments

2.1 Description, classification, equipment requirements

This comparison is to clarify the EMC environments, their conditions and standards referenced at the beginning.

Comparison and definition of EMC environments

Public low voltage system	Industrial low voltage system
First environment	Second environment
Basic electromagnetic environment (Residential area, sales area, business premises, small business, laboratory) according to EN 61326-1 (2013)	Industrial electromagnetic environment according to EN 61326-1 (2013)
Description of environments, equipment requirements and classifications according to EMC test standard	
Equipment requirement "low transient emission"	Equipment requirement "high immunity"
"Equipment Group 1, Class B" - EN 55011(B) - Transient conducted and radiated emissions, emissions - EN 61000-3-2 - Transient conducted emissions, harmonic currents - EN 61000-3-3 - Transient conducted emissions, flicker	"EMC Environment Class 3"; "Equipment Group 1, Class A" - EN 55011(A) - Transient conducted and radiated emissions, emissions - EN 61000-4-2 - Immunity, Electrostatic discharge, ESD - EN 61000-4-3 - Immunity radiated emission, HF - EN 61000-4-4 - Immunity conducted emission, transient burst - EN 61000-4-6 - Immunity conducted emission, HF
"Installation Class 2" (electrical environment) EN 61000-4-5 - Immunity conducted emission, surge voltage, surge - Electrical environment where the cables are routed separately. - Surges / surge voltages up to 1 kV may occur.	"Installation Class 3" (electrical environment) EN 61000-4-5 - Immunity conducted emission, surge voltage, surge - Electrical environment where the cables are routed in parallel. - Surges / surge voltages up to 2 kV may occur. - Unshielded inductive loads.

2.2 Typical instructions for EMC and electrical environments

INFORMATION

Class A equipment according to EN 55011 is intended to be used in “industrial electromagnetic environments”. Their electromagnetic compatibility may be affected if operated in other electromagnetic environments.

INFORMATION

Class B equipment according to EN 55011 is suitable for use in “basic electromagnetic environments”.

INFORMATION

These devices have the immunity required by EN 61326-1 for the operation in “industrial electromagnetic environments”.

INFORMATION

The exclusive use of TN-S networks is recommended in terms of EMC.

INFORMATION

All of the following points of the general applicable guidelines must be met for outdoor installations:

- Selection of cables
- Cable routing
- Surge protection
- Lightning protection system
- Set up / protection of equipment
- The environmental conditions for the intended use must be complied with.

INFORMATION

The responsible body is responsible for times the final compliance check or the assessment of the electromagnetic compatibility of an application or system at the place of its installation.

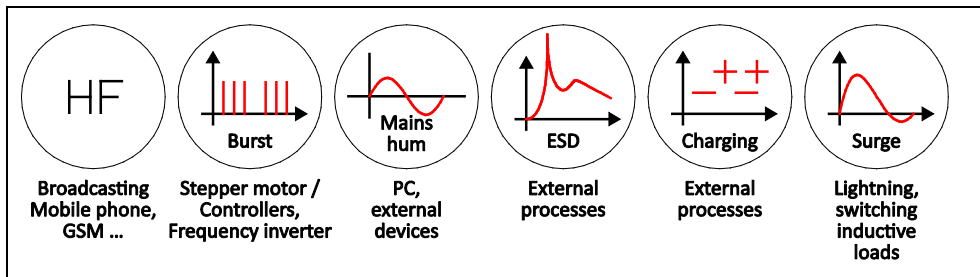
3 EMC strategies to comply with EMC

Huber temperature control units are tested for EMC compliance according to the current applicable standards and specified inspections. The EMC-compliant configuration of a plant / system is necessary to maintain its "EMC Performance".

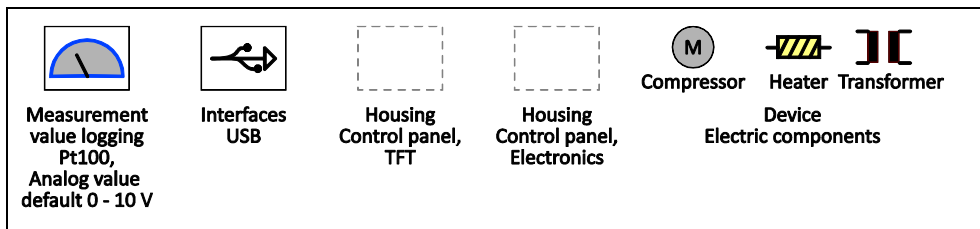
Typology and classification of faults

Narrow-band emitters	Broad-band emitters
<ul style="list-style-type: none"> - Broadcasting - Television - Mobile Communication - Navigation, Radar - DECT, Wi-Fi, WLAN, Bluetooth, RFID, ZigBee, NFC etc. - Magnetic Resonance Imaging - Garage door openers - RF generators (industry, research, medicine, household) - Energy saving / LED lamps - Fluorescent lamps - Switching Power Supplies - Processors - Automotive ignition systems - Power converters - Frequency converters 	<ul style="list-style-type: none"> - Electrostatic discharge (ESD) - Switched inductances, switching actions, relays ... - LEMP (lightning electromagnetic pulse) - Nuclear electromagnetic pulse - NEMP - Transients (burst)

Sources of interference



Susceptible devices



3.1 Notes on EMC interference phenomena

3.1.1 Information Problem EMC phenomena:

Balancing currents can occur in a system with longer cable paths and associated potential differences. Plants / systems can then be affected by conducted emissions, transient (burst) or high-frequency interferences (RF). Possible electrostatic charges or discharges (ESD) can then no longer be effectively controlled.

INFORMATION

ESD and HF interference must be dissipated well when operating with a remote "Pilot ONE" controller. See also Technical Data Sheet "Pilot ONE as a remote control".

INFORMATION

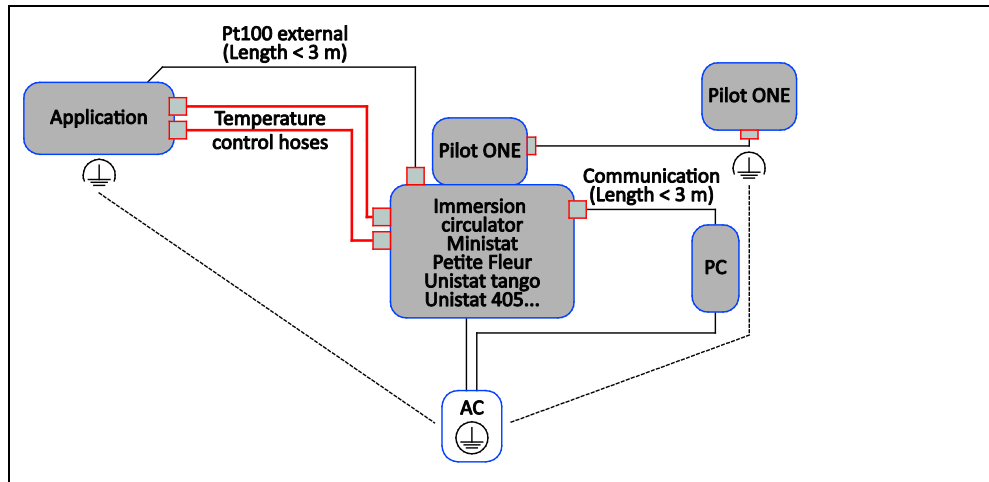
The selection of a suitable grounding concept for potential equalization of a plant or system is necessary to manage EMC phenomena in general. The EMC performance of an electrical installation is challenged by EMC phenomena such as “surge voltages”. Furthermore, a systematic execution of an EMC-compliant installation / spacing and cable selection is required. The exclusive use of “TN-S networks” is recommended as mentioned in Section 1.

3.2 EMC grounding concepts

INFORMATION

A potential equalization with a “star” topology is recommended for cable lengths up to 3 m.

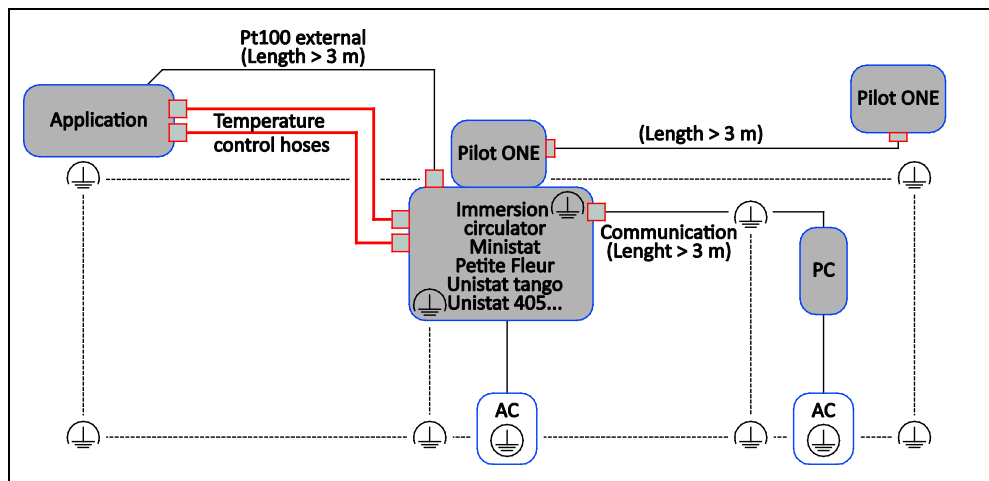
Grounding concept type “S”



INFORMATION

A potential equalization with a “mesh” topology is recommended for cable lengths over 3 m.

Grounding concept type “M”



3.2.1 Avoiding electrostatic charges

In everyday life, as well as on the job, unintentional electrostatic charges and discharges occur again and again. This can damage electronic equipment and produce unintended, hazardous ignition sources. Huber Temperature Control Units are protected against electrostatic discharges which can occur in daily use.

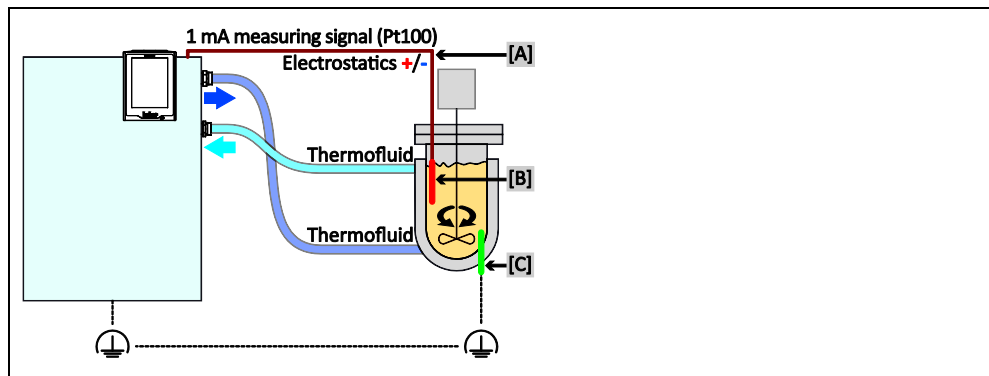
However, during “industrial engineering processes” for instant, the occurring charges can be significantly higher. It is the operator’s obligation to avoid possible risks by means of safety appraisals and appropriate measures.

Problem Statement and Solutions (applications with glass reactors):

Very high electrostatic charges may be created when using ordinary PTFE Pt100 sensors, which causes measurement errors and defects.

The measurement circuit’s flow and return flow conductor is raised in relation to the mass or earth potential - “offset voltage”. This can cause damage to electronic components due to flashover or discharge.

Prerequisites for fault-free operation



Some of the dependency factors when using glass apparatus and thermofluids are:

- the flow speed
- the electric conductivity of the thermofluid
- the viscosity of the thermofluid ...

Remedy or requirement for fault-free operation:

[A] Using external sensors with metal conduit, shielded cable and Lemo connector

Schematic representation



OR

- [B] PTFE sensors that bleed off electrostatic charges (e.g. from the company Bohlender) must be used when using aggressive media. They charge by limiting the PTFE material. The shielded cable is effective again from the Lemo jack to protect against faults.

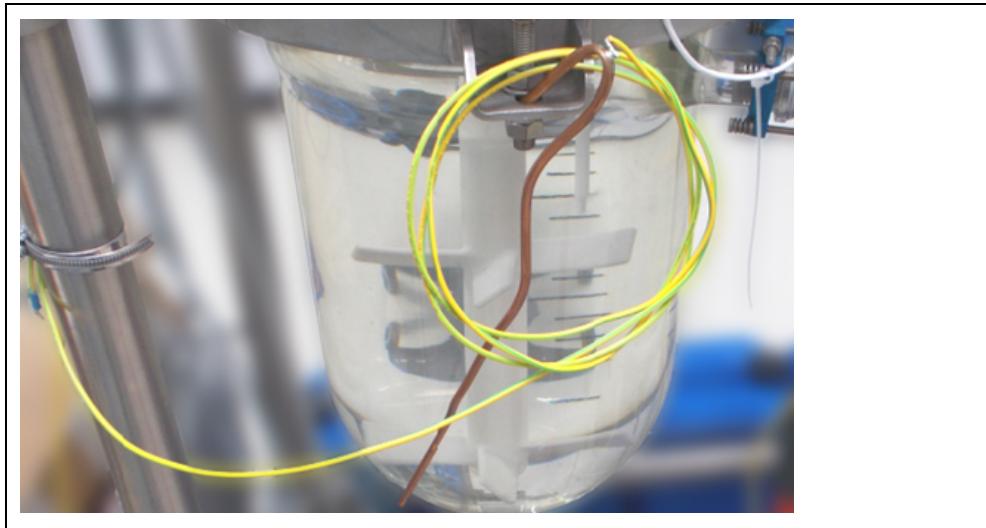
Schematic representation



OR

- [C] Connecting the customer's fluids to the earth potential via a metal rod and a grounding cable. The materials used must be compatible with the customer's fluid.

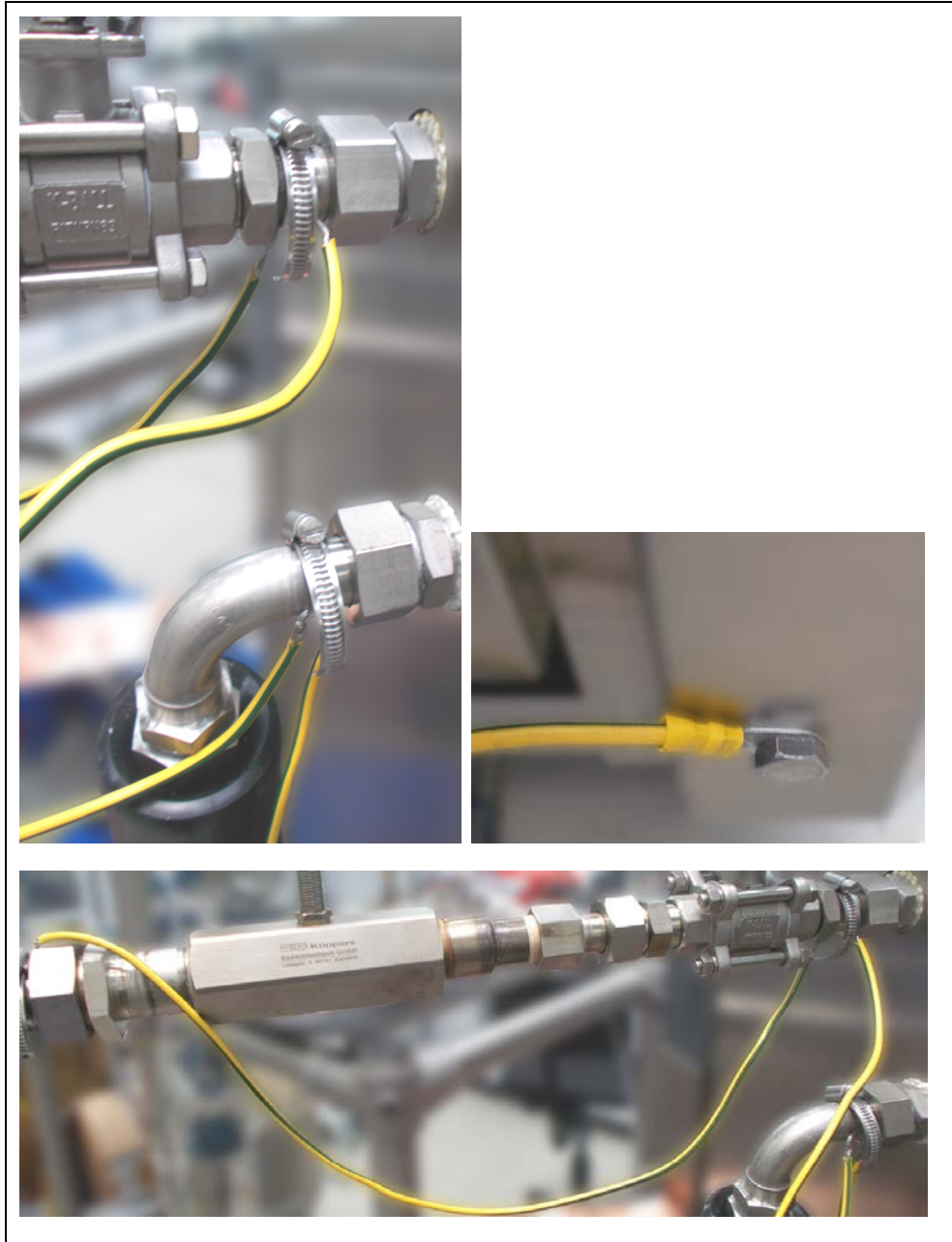
Schematic representation



other measures when using glass apparatus / reactors or units.

- All metal parts should be functionally grounded at all possible connectors (FE).
- Using special conductive finish for:
- Couplers, reactor covers, stirrer shafts, screw connections / threaded couplings, sensors, hoses.

Schematic representation



see also:

DeDietrich, article on potential equalization for glass apparatus.
BOLA, Screw connections / components for explosion protection.

other literary examples:

Rules of the Professional Association (BGR132)
Rules of the Statutory Accident Insurance (GUV-R132)
Technical Rules for Hazardous Materials (TRGS727)

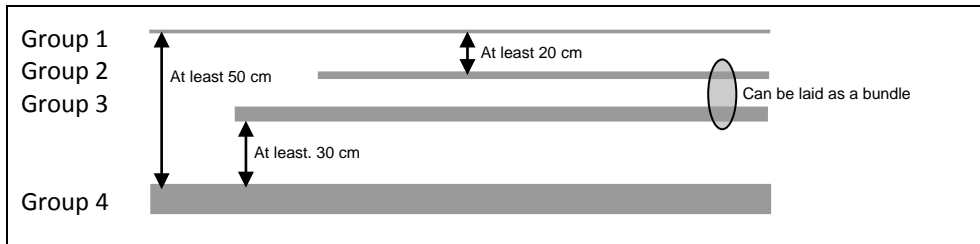
4 EMC-compliant wiring

A classification by groups is recommended for EMC-compliant cable routing and an EMC-compliant selection of circuit type. The cable groups are generally routed separately with the spacing mentioned. Only cable group 2 and 3 can be laid as a bundle.

Classification of lines

Lines	Description	Sensitivity
Group 1	Temperature measurement value logging, pressure / fill level, analog outputs 0 to 10 V, 0 to 20 mA	Sensitive
Group 2	Communication interfaces, CAN, RS232, RS485, USB, Ethernet	Slightly sensitive
Group 3	24 V DC system power supply, Digital inputs / outputs	Slightly prone to malfunction
Group 4	230 V control lines for relays and contactors, load circuits	Prone to malfunction

Selection of spacing



Selection of type of shielding

The selected cable circuit type depends on the class of the routed signal						
Class	EMC behavior	Single strand	Twisted pairs	Reinforced twisted pairs	Shield (braid) twisted	Shield (braid & film) twisted
I	Sensitive	-	0	+	++	++
II	Not very sensitive	0	+	+	++	++ ^{a)}
III	Slightly prone to malfunction	0	+	+	++	++ ^{a)}
IV	Prone to malfunction	--	-	0	+	++

Good bad
 ++ + 0 - --^{a)} expensive, usually unnecessary.

INFORMATION

Shielded cables:

We generally recommend to shield both sides across a large area (360° connection). An additional compensation cable must be laid for potential differences caused by shields that are connected on both sides.

Inspired by **temperature** designed for you

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