EN

WHITE PAPER

SOLUTIONS FOR FOOD PRODUCTION

OVERVIEW OF AREAS AND REQUIREMENTS

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IPF ELECTRONIC

TABLE OF CONTENTS

1 Introduction 3

2 Areas in food production 4

3 Rules and standards in the European region 4
3.1 Food area 4
3.2 Wash-down/splash zone: 4
3.3 Periphery/non-food area 5

4 Hygienic design 6

5 Implementation at ipf electronic 6

6 Products for use in the food area 7
6.1 Simply and easily through the cleaning process without disassembly 7
6.2 Classic and capacitive filling level measurement with special characteristics 7
6.3 Optimum chemical resistance thanks to full stainless steel housing 7
6.4 LED industrial lighting for increased hygiene requirements 8
6.5 Maximum protection in IP69K with extra intelligence through IO-Link 8

7 Application examples of ipf products 9

1 INTRODUCTION

Global food production is confronted with a wide range of challenges and as a result, is constantly evolving. Particularly in view of a growing global population, the global change of the earth's climate, but also in exceptional circumstances such as a global pandemic, it is growing in importance as a system-relevant industry. Moreover, as the needs of consumers are constantly changing, the processes within the food industry must become increasingly efficient, and must do so while simultaneously using resources as sparingly as possible.

The various requirements on production systems with respect to their parameters (e.g. temperature, duration of individual process steps, processing speed, etc.) as well as the characteristics of the used media (e.g. solid, liquid, gaseous, acidic, alkaline, but also grain size, viscosity, volume and shape) make it difficult to establish standards in this area. This applies to among other things, the many different cleaning processes as, for example a dairy plant must be cleaned in a fundamentally different way than a plant for cereal flakes, to give just two examples.

Thus, individual quality standards generally apply for each production system and each process. Failure to strictly comply with relevant requirements may, under certain circumstances, make product recalls[1] unavoidable. A study conducted by Allianz Global Corporate & Specialty (AGCS) in 2017 came to the conclusion that, with 16% of all claims and an average cost for a product recall of nearly 9.5 million USD (8 million EUR), the food and beverage sector is the industry second worst affected by this problem[2] [3]. Against this background, the increased number of recalls in many countries[4] [5] indicates a clear potential for improvement in the process controls.

Recalls are expensive and time-consuming. To say nothing of the declining trust of the consumers in a product that has been recalled once who may instead reach for a competitor's product on the next shopping trip. This white paper aims to provide an overview of the areas as well as of requirements in the food industry and of products from ipf electronic which, given their features, can meet the higher requirements in the environments used for the production and further processing of foods.

Because the requirements on production technology and the relevant, applicable guidelines are too far-reaching and varied, this white paper does not attempt to describe the entire industry with all of its different plants and machines in the context of the solutions from ipf electronic.
Against this background, it must be determined on a case-by-case basis whether a given product from ipf electronic is actually suitable for an application.

[1] https://www.lebensmittelwarnung.de/bvl-lmw-de/liste/lebensmittel/deutschlandweit/10/0
[2] Serving as the basis for the study were 367 product recall claims in the insurance sector in 28 countries and 12 industries.
[3] https://www.allianz.com/en/press/news/business/insurance/171206-avoiding-total-recall.html
[4] https://www.verbraucherzentrale.de/wissen/lebensmittel/lebensmittelproduktion/wann-gibt-es-eine-lebensmittelwarnung-12597
[5] https://www.foodstandards.gov.au/industry/foodrecalls/recallstats/Pages/default.aspx

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2 AREAS IN FOOD PRODUCTION

The following chapter describes the different areas of a food production system. An exact classification is difficult due to the complexity of food production, however. To nevertheless be able to conduct a classification, DIN EN 1672-2 "Food processing machinery - Basic concepts - Part 2: Hygiene and cleanability requirements" concentrates on the following three areas with regard to food processing machinery[6]:

- **Food area:**
  Direct contact with the food
- **Wash-down/splash zone:**
  Food waste can land here but may not, however, return to the main food flow
- **Periphery/non-food area:**
  No contact with food, special operating conditions do however require appropriate safety measures.

3 RULES AND STANDARDS IN THE EUROPEAN REGION

Depending on which food or beverage is processed in a system, a number of regulations and standards apply [7].

3.1 FOOD AREA

Each system component or machine part that is intended to come into contact with food is, according to German Food and Feed Code (LFBG), Paragraph 2, as well EC Regulation 1935/2004 Article 1, Paragraph2, a material or article intended to come into contact with food and must be handled accordingly.

All materials that are intended to come into contact with food require a **Declaration of Conformity for Harmlessness**[8]:

- For metals and alloys, so-called "specific release limits" (SRLs) of the EDQM (European Directorate for the Quality of Medicines & HealthCare), Council of Europe[9]
- For plastics, EC Regulation 10/2011 applies as well as the individual measures of the German Federal Institute for Risk Assessment (BfR)
- All other materials fall under EC Regulation 1935/2004. Individual measures may be issued for materials not listed.

3.2 WASH-DOWN/SPLASH ZONE:

If an article is not intended to come into contact with food due to the article's use (e.g. the outer shell of a stirring tank), this is not considered to be an article for food that is subject to the previously mentioned regulations. Nevertheless, food waste can land in a splash zone and contaminate the production system. Hygiene measures are, therefore, to be complied with in this area as well. The risk of microbial contamination must be avoided even in the case of indirect contact. The additional hygiene measures in the splash zone include, among others, the prevention of mold formation, as the spores could re-enter the main flow.

[6] DIN EN 1672-2:2021-05, Chapter 3, Picture 1
[7] DIN EN 1672-1:2014-12, Annex C
[8] EC Regulation 1935/2004, Article 16
[9] EDQM "Metals and alloys used in food contact materials and articles," Article 4

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3.3 PERIPHERY/NON-FOOD AREA

As already mentioned, there is no contact in this area with the actual food. Possible environmental conditions such as temperature or humidity could, however, affect the production system and its components. The resulting requirements are to be checked on a case-by-case basis to ensure the unrestricted function of systems and components. Preventative measures here can be aimed, e.g. at ensuring that no moisture collects or dirt is deposited. Also applicable for all areas and levels of food production and processing as well as the sale of materials and objects[10] is the so-called "good manufacturing practice" [GMP] acc. to EC Regulation 2023/2006[11].

GMP identifies those aspects of quality assurance that ensure that materials and objects are manufactured and inspected in a consistent manner so as to guarantee their compliance with the applicable laws and that they meet the quality standards appropriate for their intended purpose[12]. Moreover, every business operator in the food sector is, in accordance with EC Regulation 852/2004 or 853/2004, required to implement procedures based on Hazard Analysis and Critical Control Points principles (HACCP)[13]. With respect to a HACCP concept, there are various aspects that are to be taken into account[14]:

- Compliance with microbiological criteria for food
- Processes that are necessary for achieving the objectives set forth by this regulation (EC Regulation 852/2004)
- Compliance with the requirements regarding temperature control for food
- Preservation of the cold chain
- Sampling and analysis

The measures relating to a Hazard Analysis and Critical Control Points concept apply for all production, processing and distribution levels of food[15]!

[10] EC Regulation 2023/2006, Article 2
[11] EC Regulation 2023/2006, Article 1
[12] EC Regulation 2023/2006, Article 3, a
[13] EC Regulation 852/2004, Article 3
[14] EC Regulation 852/2004, Article 4
[15] EC Regulation 852/2004, Article 3

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4 HYGIENIC DESIGN

In the context of industrial food production, the term "hygienic design" crops up over and over again. "Hygienic design" describes the constructive design of components or systems intended to minimize deposits, adhesions and contaminants of all types. Issues such as dead spaces are to be avoided and sufficient corner radii or special surfaces taken into account.

A document frequently mentioned in this context is the Hygienic Design Certificate of the European Hygienic Engineering & Design Group (EHEDG), which is issued by certification providers of the EHEDG. This is, however, not a legally required certificate, but is instead voluntary. The certificate refers to the easy-to-clean implementation of the systems and all components mounted therein depending on the cleaning process (with/without removal, cleaning in place (CIP), sterilization in place (SIP), etc.). The constructive specifications of the EHEDG are based on, among other things, the aforementioned DIN EN 1672-2 as well as the American 3-A Sanitary Standards[16]. Hygienic design also serves to ensure the compliance of the cleanability of individual components or entire systems, but does not necessarily need to be evaluated by an EHEDG certification body. Because the considered component or system is required to undergo an HACCP analysis for field use, it is a good idea to apply and implement constructive specifications of a hygienic design with focus on microbiological criteria[17].

5 IMPLEMENTATION AT IPF ELECTRONIC

ipf electronic's product portfolio includes various solutions that are suitable for use in the previously described areas. Suggested on the IPF website are only those products that **are permitted for use in accordance with European law**.

Listed under product-contacting applications are sensors whose materials are approved for food contact in accordance with European law. Such sensors may come from, among others, the following product groups:

- Temperature sensors
- Filling level sensors
- Flow sensors
- Pressure transmitters

ipf electronic likewise offers many products for the splash- and non-food zone. To simplify the selection-making process, these can be found in the product group **for increased requirements**:

Requirements of product groups for wash-down zone / splash zone/ periphery:

- IP degree of protection ≥ IP65
- Increased corrosion resistance of the materials
- Increased chemical resistance of the materials

[16] https://ehedg.co.uk/

[17] Hygienic requirements on the production, handing and bringing to market of food are regulated in EU Regulation (EC) No. 852/2004 on the hygiene of food and in Regulation (EC) No. 853/2004 with specific hygiene requirements for food of animal origin.

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6 PRODUCTS FOR USE IN THE FOOD AREA

6.1 SIMPLY AND EASILY THROUGH THE CLEANING PROCESS WITHOUT DISASSEMBLY

Products for direct contact with foods are the pressure transmitters from ipf electronic. Both the housing and the active surface of the sensor are made of durable V4A stainless steel (1.4404 / 1.4435). Due to its high temperature resistance, these sensors are ideal for even SIP cleaning processes (sterilization in place).

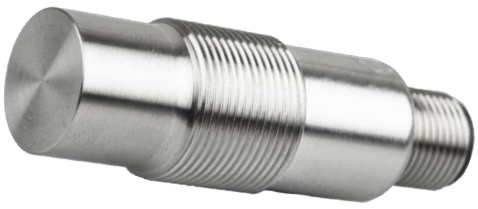
6.2 CLASSIC AND CAPACITIVE FILLING LEVEL MEASUREMENT WITH SPECIAL CHARACTERISTICS

Filling level checks are necessary in many different processes. Equally diverse are the possible measuring methods for filling level monitoring. The following two solutions can perform this task in hygienic areas.

One of the most common methods for checking filling levels is the media touching, capacitive filling level measurement. A special feature of our capacitive sensors of the **FK9xxxxx** series is the housing made of polytetrafluorethylene (PTFE), which is suitable for contact with food. Due to the shape of the piston, the sensors have an outstanding dripping behavior and are, thus, especially well suited for monitoring containers with viscous media.

6.3 OPTIMUM CHEMICAL RESISTANCE THANKS TO FULL STAINLESS STEEL HOUSING

Our ultrasonic sensors monitor not only filling levels but also check them continuously and contactlessly at a switching distance of 150-800mm. The housing made completely of 1.4404 stainless steel including active surface, ensures optimum chemical resistance during cleaning processes.



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6.4 LED INDUSTRIAL LIGHTING FOR INCREASED HYGIENE REQUIREMENTS

An example from our product range for increased requirement conditions is LED industrial lighting. Unlike glass, the polycarbonate protective housing is shatterproof. Moreover, the special design of the lights without dead spaces minimizes potential deposits and enables simple, better cleaning.

6.5 MAXIMUM PROTECTION IN IP69K WITH EXTRA INTELLIGENCE THROUGH IO-LINK

Suitable for both reliable as well as robust use in splash zones are, for example our optical sensors with background suppression in wash-down design.
The housing made of stainless steel (1.4404), is resistant to acids and alkaline cleaners. With the highest protection class IP69K, the housing is completely sealed, preventing the penetration of moisture during production or cleaning processes. Moreover, the additional IO-Link interface simplifies configuration of the sensors and thereby eases integration in existing processes.

ⓘ NOTE

Because the requirements on production technology and the relevant valid regulations are so extensive and varied, it is difficult to ensure that a specific product from ipf electronic is actually suitable for a given application in every single case. Prior to practical use, each solution should be checked with respect to the given or required process parameters.

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7 APPLICATION EXAMPLES OF IPF PRODUCTS

In the following, you will find further examples for fields of use of ipf products in food production:

Application example	Sensor version
Filling level	Camera sensors Ultrasonic sensors Capacitive sensors Through-beam sensors Optical diffuse reflection sensors Microwave sensors
Dimensions, geometry	Camera sensors Optical diffuse reflection sensors Ultrasonic sensors
Color	Camera sensors
Position, presence checks	Camera sensors inductive sensors Capacitive sensors Optical diffuse reflection sensors Ultrasonic sensors Through-beam sensors Cylinder sensors Magnetic field sensors Retro-reflective sensors
Speed, path	Encoders Optical diffuse reflection sensors
Safety	Safety light curtains
Pressure	Pressure sensors Pressure transmitters
Temperature	Temperature sensors
Flow	Flow sensors for different media
Consumption	Consumption meters for compressed air Consumption meters for technical gases
Illumination	LED lights
Film	Ultrasonic sensors Optical diffuse reflection sensors Through-beam sensors Retro-reflective sensors Capacitive sensors
Connection technology	Cable sockets Connection cables
Counters	Frame light barriers Camera sensors inductive sensors Capacitive sensors Optical diffuse reflection sensors Ultrasonic sensors Through-beam sensors Magnetic field sensors Retro-reflective sensors

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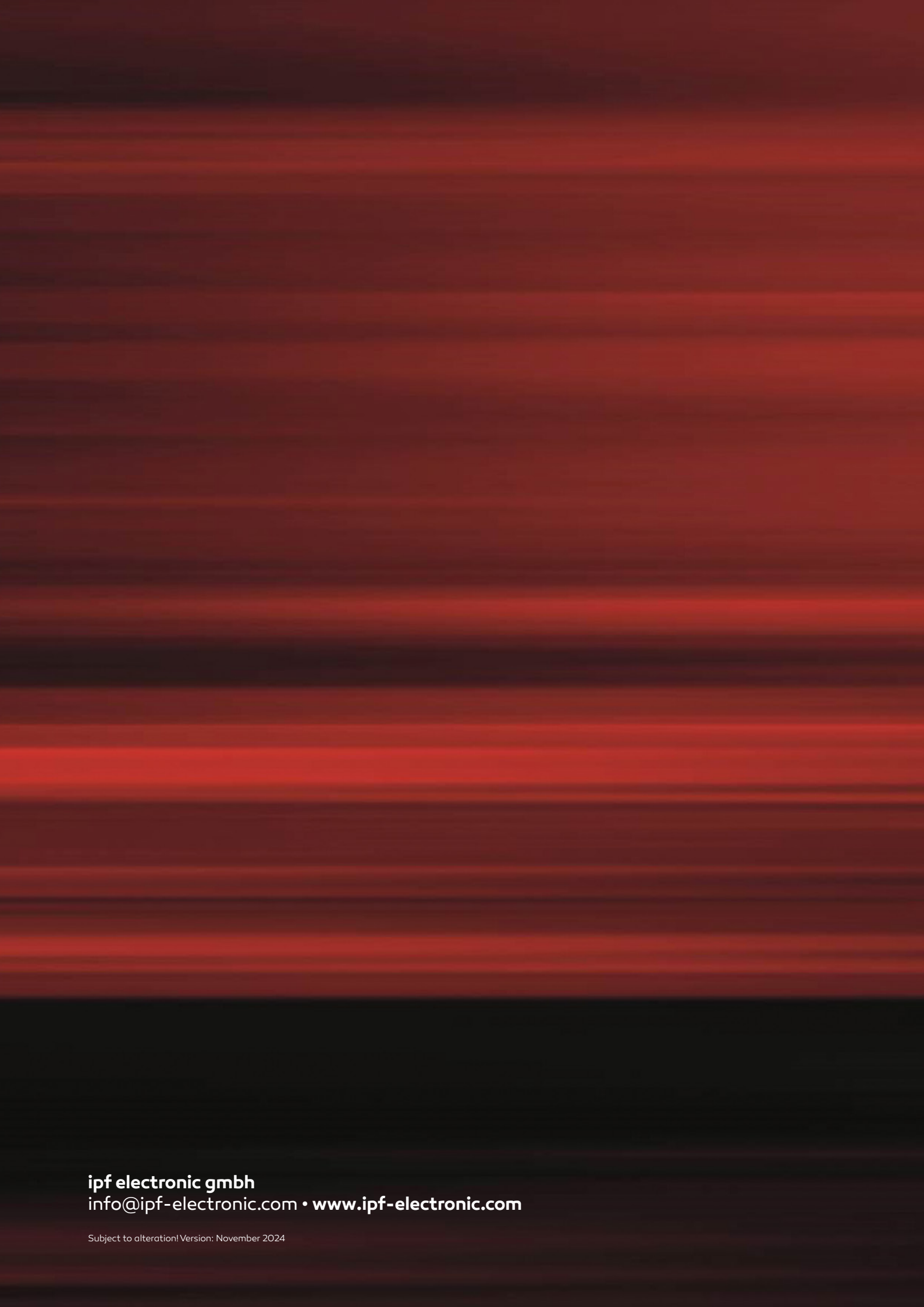

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