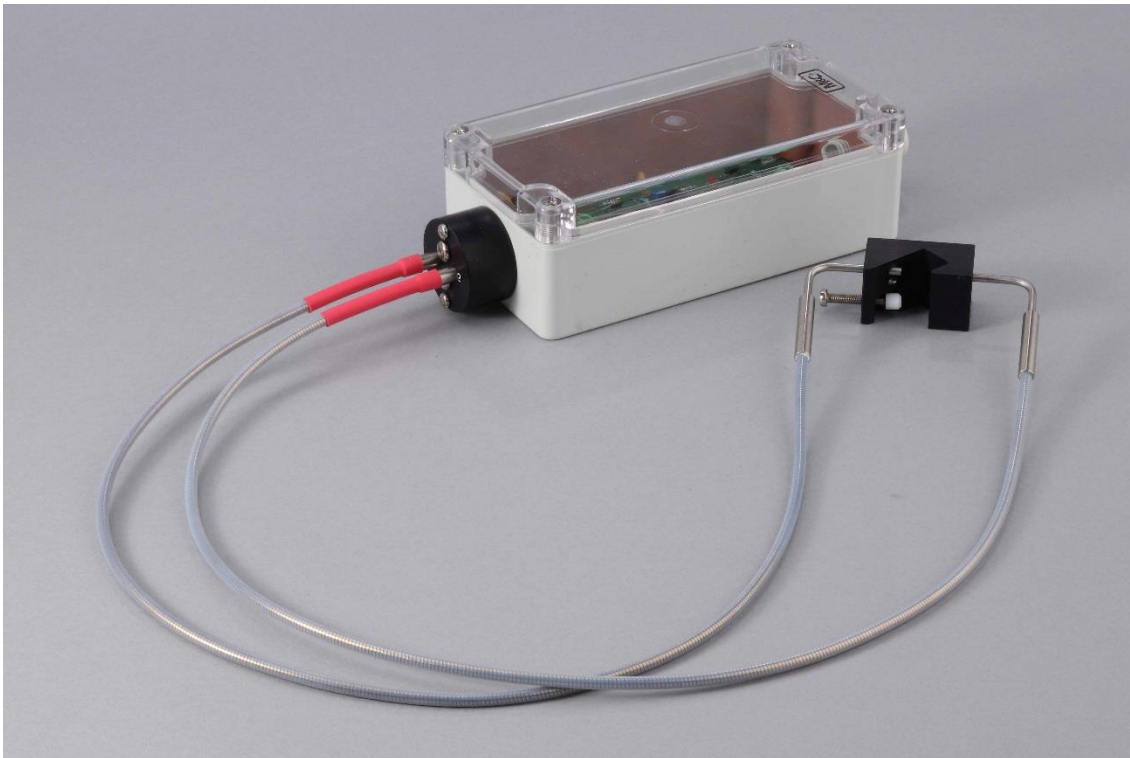


# Optical Flow Alarm Sensors Series FA<sup>®</sup>

## FA1-H

Instruction Manual  
Version 1.00.01



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**Dear customer,**

we have made up this operating manual in such a way that all necessary information about the product can be found and understood quickly and easily.

Should you still have any question, please do not hesitate to contact **M&C** directly or go through your appointed dealer. Respective contact addresses are to be found in the annexe to this operating manual. Please also contact our homepage [www.mc-techgroup.com](http://www.mc-techgroup.com) for further information about our products. There, you can read or download the data sheets and operating manuals of all **M&C** products as well as further information in German, English and French.

This Operating Manual does not claim completeness and may be subject to technical modifications.

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## 1 GENERAL INFORMATION

The product described in this operating manual has been examined before delivery and left our works in perfect condition related to safety regulations. In order to keep this condition and to guarantee a safe operation, it is important to heed the notes and prescriptions made in this operating manual. Furthermore, attention must be paid to appropriate transportation, correct storage, as well as professional installation and maintenance work.

All necessary information a skilled staff will need for appropriate use of this product are given in this operating manual.

## 2 DECLARATION OF CONFORMITY



The product described in this operating manual complies with the following EU directives:

### EMV-Instruction

The requirements of the EU directive 2014/30/EU “Electromagnetic compatibility“ are met.

### Low Voltage Directive

The requirement of the EU directive 2014/35/EU “Low Voltage Directive“ are met.  
The compliance with this EU directive has been examined according to DIN EN 61010.

### Declaration of conformity

The EU Declaration of conformity can be downloaded from the **M&C** homepage or directly requested from **M&C**.

### 3 SAFETY INSTRUCTIONS

**Please take care of the following basic safety procedures when mounting, starting up or operating this equipment:**

Read this operating manual before starting up and use of the equipment. The information and warnings given in this operating manual must be heeded.

Any work on electrical equipment is only to be carried out by trained specialists as per the regulations currently in force.

Attention must be paid to the requirements of VDE 0100 (IEC 364) when setting high-power electrical units with nominal voltages of up to 1000 V, together with the associated standards and stipulations.

Check the details on the type plate to ensure that the equipment is connected to the correct mains voltage.

Protection against touching dangerously high electrical voltages:

Before opening the equipment, it must be switched off and hold no voltages. This also applies to any external control circuits that are connected.

The device is only to be used within the permitted range of temperatures and pressures.

Check that the location is weather-protected. It should not be subject to either direct rain or moisture.

The device must not be used in hazardous areas.

Installation, maintenance, monitoring and any repairs may only be done by authorized personnel with respect to the relevant stipulations.

### 4 WARRANTY

If the equipment fails, please contact **M&C** directly or else go through your **M&C** authorised dealer. We offer a one year warranty as of the day of delivery as per our normal terms and conditions of sale, and assuming technically correct operation of the unit. Consumables are hereby excluded. The terms of the warranty cover repair at the factory at no cost or the replacement at no cost of the equipment free ex user location. Reshipments must be send in a sufficient and proper protective packaging.

## 5 USED TERMS AND SIGNAL INDICATIONS



**DANGER!**

This means that death, severe physical injuries and/or important material damages **will occur** in case the respective safety measures are not fulfilled.



**WARNING!**

This means that death, severe physical injuries and/or important material damages **may occur** in case the respective safety measures are not fulfilled.



**CARE!**

This means that minor physical injuries **may occur** in case the respective safety measures are not fulfilled.

**CARE!**

Without the warning triangle means that a material damage may occur in case the respective safety measures are not met.

**ATTENTION!**

This means that an unintentional situation or an unintentional status may occur in case the respective note is not respected.



**NOTE!**

These are important information about the product or parts of the operating manual which require user's attention.

**SKILLED STAFF**

These are persons with necessary qualification who are familiar with installation, use and maintenance of the product.

## 6 INTRODUCTION

Optical flow monitoring systems are used for continuous gas analysis with corrosive sample gases, to have the possibility of using flowmeters with corrosion resistant floating balls out of e.g. glass. The optical flow monitoring systems **FA1-H-..** are an alternative to the optical flow monitoring systems FA-1 with light fork barrier. These units can be used in heated gas conditioning systems up to 180°C also with non metallic or very small floating balls.

## 7 APPLICATION

The optical flow monitoring unit with light guides is used in gas analysis on heated flowmeters with temperatures > 60 °C. The measuring cones must be transparent. Thanks to optical scanning, very low flow quantities can be recorded even in case of flowmeters with non-metallic or very small (1 mm) floats.

## 8 TECHNICAL DATA

	Sensor Head FA2-H	Light guide FO1	Light guide FO3	Light guide FO2	pre-amplifier K-FA-H
Part Number	02 E 4002	02 E 4060	02 E 4063	02 E 4065	02 E 4010
Function monostable	1x	2x			1x
Measuring tube	5-14 mm				
Light guide length		600 mm	900 mm	1200 mm	
Dimensions W x D x H	24 x 40 x 24	ø 6 mm			80 x 160 x 55
Weight	90 g	230 g	330 g	420 g	560 g
Material	anodized aluminium	glass fibre, SS 316Ti, brass-chromed			Polycarbonate combustibility class VO (UL94)
Assembly	Fixed with clamping screw				Wall mounting
Cable entry					terminal range 5mm - 10mm
Electrical connection					terminals 2,5mm <sup>2</sup>
Supply voltage					12V DC internal from FA-1..
Electrical standard					EN 61010
Operating temperature	- 25°C to + 180°C				-25°C to + 60°C
Storage temperature	- 25°C to + 70°C				
System of protection	IP65 EN 60529				

### 8.1 OPTIONS

Separate electronic controller required for the **K-FA-H** pre-amplifier:

Electronic controller	FA-1.1	FA-1.4
Part No. 230V 50/60Hz	02 E 7300*	02 E 7110
Part No. 115V 50/60Hz	02 E 7300*	02 E 7110 a
Part No. 24V DC	02 E 7300 d	02 E 7110 d
Part No. 24V AC	02 E 7300 b	02 E 7110 d

Reversing power consumption 230V 50/60Hz / 115V 50/60Hz, adjusted at works: 230V 50/60Hz  
 Technical data: see data sheet FA-1.1., FA-1.4, K-FA 5-6.10.2

Complete flow monitoring unit **FA1-H-..** :

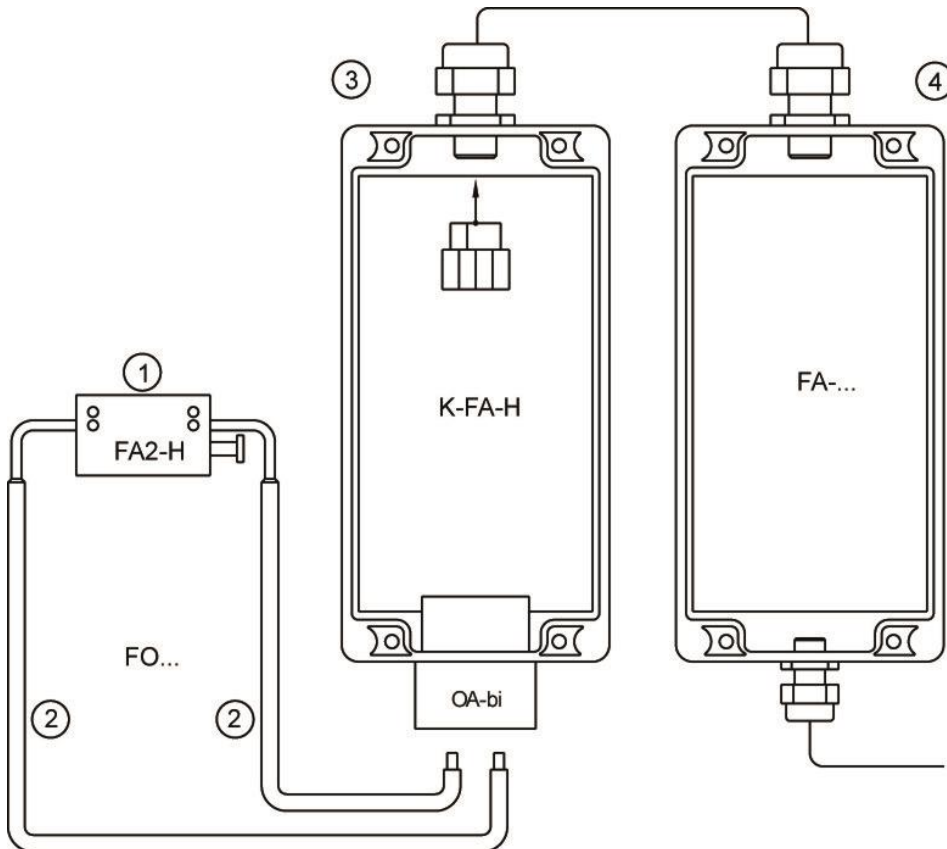
Complete flow monitoring unit	Type Part No.	FA1-H-6 02 E 4270	FA1-H-9 02 E 4273	FA1-H-12 02 E 4275
consisting of :				
Sensor FA2-H	(02 E 4002)	1 piece		
Light guide FO1, 600 mm long	(02 E 4060)	2 pieces		
Light guide FO3, 900 mm long	(02 E 4063)		2 pieces	
Light guide FO2, 1200 mm long	(02 E 4065)			2 pieces
Pre-amplifier with adapter K-FA-H	(02 E 4010)	1 piece		
Electronic controller FA-1.1 / 230V/115V	(02 E 7300)	1 piece		

## 9 DESCRIPTION

The **M&C** flow monitoring unit **FA1-H-..** consists of 4 sub-assembly modules:



1. the patented sensor head **FA2-H**,
2. the 2 light guides **FO..** for monostable function
3. the **K-FA-H** pre-amplifier
4. the electronic controller **FA-1.1** or **FA-1.4** (see data sheet FA-..., K-FA 5-6.10.2)



**Figure 1 Complete optical flow monitoring system**

The sensor head **FA2-H** is assembled on e.g. the **FM1-H** flowmeter by means of a pressure screw with its stationary open prism to the measuring glass. Assembly is simple and does not require any disassembly of the flow-measuring glass.

The **FO1** light guide is supplied with a standard length of 600 mm. Light guide **FO3** (900 mm long) and **FO2** (1200 mm long) can be supplied for greater length requirements. The angled light-guide ends are fixed into the **FA2-H** sensor head with one pressure screw each. Two light-guides are needed for the monostable function. By use of the pre-amplifier **K-FA-H** a distance of 200 meters between the flow meter and the electronic controller **FA-1..** (see data sheet 5-6.10.2) is possible without problems.

The LED emitters' light beam passes through the **FO ..** light guides and falls upon the photo-transistor through e.g. the **FM1-H** flowmeter measuring glass. As soon as the float breaks the light beam, the photo-transistor is blacked out. The **FA-1..** electronic controller analyses this changed status accordingly. By the monostable version a MIN alarm function in the lowest sensor setting position is guaranteed.

## 10 RECEIPT OF MARCHENDISE AND STORAGE

The optical flow monitoring system is delivered in 4 sub-assembly modules :

sensor head **FA2-H**,

2 light guides **FO..**  
**K-FA-H** pre-amplifier  
 electronic controller **FA-1.1** or **FA-1.4**.

- Please take the optical flow monitoring system and possible special accessories carefully out of the packaging material immediately after arrival, and compare the goods with the items listed on the delivery note;
- Check the goods for any damage caused during delivery and, if necessary, notify your transport insurance company without delay of any damage discovered.



**NOTE!**

**The optical flow monitoring system should be stored in a protected frost-free area !**

## 11 MOUNTING

The mono-stable version has got 2 light guides **FO1/2/3** which must be mounted according to drawing inside the sensor head **FA2-H** and inside the connection adaptor **OA-bi** in opposite position 2 + 1. Inside the connection adaptor, there are always 2 high capacity LED's as light source and 2 photo transistors as receiver which are mechanically protected.

In case of mono-stable function, only 1 piece each is used and the way 4 + 3 are shut with screws M4x8 in the works in order to avoid optical interferences.

- The sensor head **FA2-H** has to be fixed to the desired control point of the flow sensor measuring tube with the pressing screw showing to the right side. It has to be fixed in such a way that the light ray of the flow alarm sensor should not be deflected by an eventual inscription or coloured background of the measuring tube.

**CARE!**      **Never screw down the stainless steel pressing screw without the white coloured protecting cap! It should always be only hand-screwed!**

- The light guides type **FO1** have got a total length of 600 mm, type **FO2** has got a length of 1200 mm and type **FO3** has got a length of 900 mm. They have to be lead with their inserted ends from inside to outside via a cable gland or similar in the heat isolated wall of a heated housing. Attention must be paid that the angled 3mm light guide ends in the positioned sensor head **FA2-H** can be mounted without pulling. The fixing of the light guides by a cable gland or similar can only be effected after the mounting has been finished because in the next mounting step they have to be screwed into the adapter **OA-bi**.

**CARE!**      **The metallic protective covering of the spiral hose of the light guides must not be bended to tight, the minimum bending radius is 25 mm.**

- First of all, the 2 light guide ends have to be mounted according to their marking (1+2). They are mounted with their metal screwing ends in the connection adapter **OA-bi** which is situated in the housing wall of the pre-amplifier **K-FA-H** for mounting in "cold area" by turning right-hand until limit stop.

- Push one angled light guide end according to the marking (2) into the location hole on the left side of the sensor head **FA2-H**. Push them as far as they touch the measuring glass of the flowmeter e.g. **FM1-H**.
- Push the other angled light guide according to the marking (1) as far as possible into the location hole on the right side of the sensor head **FA2-H** so that the light guide ends touch the measuring glass of the flowmeter.

**NOTE!**

In case the light guide ends cannot be pushed deep enough, the fastening screws in the front side of the sensor head must be unscrewed accordingly by turning left-hand.

- The light guide ends are fixed in the sensor head with one fastening screw each by turning right-hand.

**CARE!**

Fasten the light guide ends only fingertight.

**NOTE!**

The conception of the forked light barrier guaranties a problem-free function in normal day light or normal ambient light. A strong light from outside to the sensor must, however, be avoided.

- Mount the pre-amplifier **K-FA-H** and electronic controller **FA1-...** A distance of 200 meters between pre-amplifier and electronic controller is no problem.

## 12 ELECTRICAL CONNECTIONS

**WARNING!**

False supply voltage can damage the equipment. When connecting the equipment, please ensure that the supply voltage is identical with the information provided on the model type plate!

**NOTE!**

For the assembly of power installations with rated voltages up to 1000V, the requirements of VDE 0100 and relevant standards and specifications must be observed!

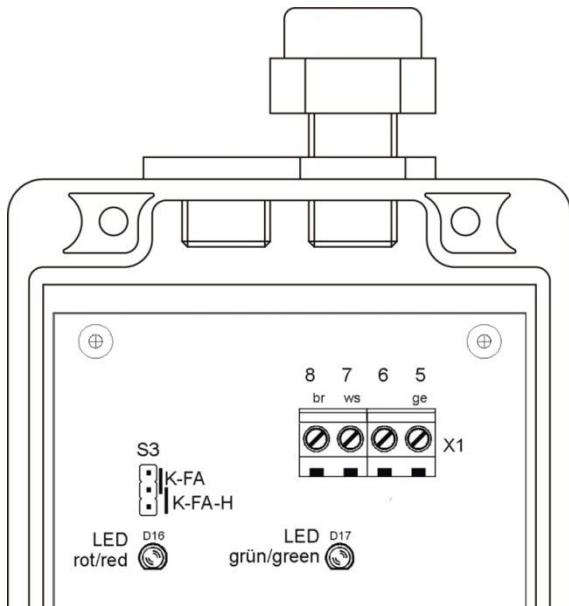
The main circuit is equipped with a fuse corresponding to the nominal current (over current protection); for electrical details see technical data (chapter 8 and manual 5-6.10ME).

For the electrical connection, the following steps have to be carried out (see also figure 2+3):

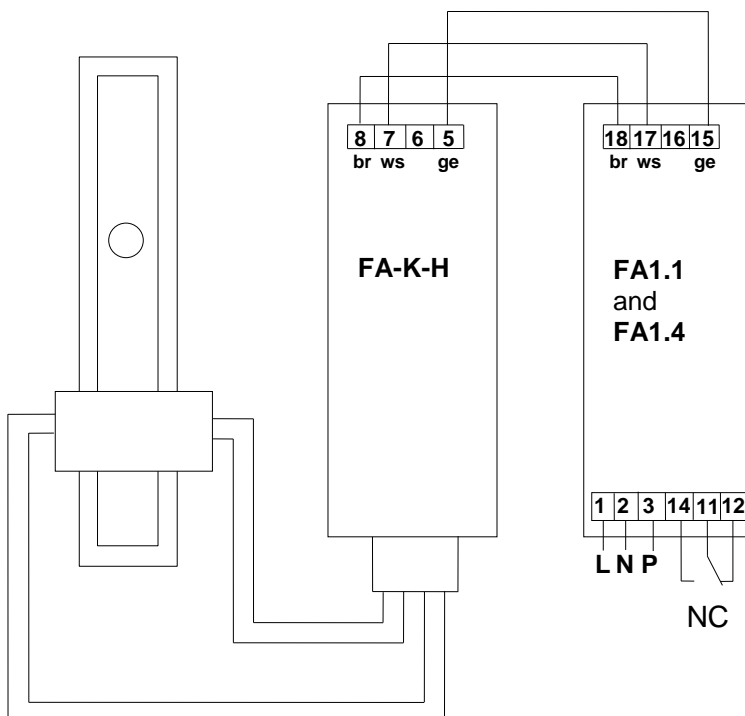
- Loosen the 4 lid screws and remove the lid of pre-amplifier **K-FA-H**.
- Lead the connection cable through the respective clamping screw.

- The electronic controller **FA-1..** has to be connected on clamping block X1, terminals 5 = yellow, 7 = white and 8 = brown.

Further electrical connection of the electronic controller **FA-1..** is described in manual 5-6.10ME, chapter 13.



**Figure 2** Electrical connection of the pre-amplifier K-FA-H



**Figure 3** Electrical connection FA1-H

### 13 STARTING

Check the correct constellation of the equipment (Fig.1).

**WARNING!**

**False supply voltage can damage the equipment. When connecting the equipment, please ensure that the supply voltage is identical with the information provided on the model type plate!**



- Without gas charging, the floating ball in the flowmeter is in down position. In case of mono-stable function, the sensor head is mounted on the measuring tube in such a way that the floating ball is placed in its deepest possible position inside the sensor head and darkens the light ray of the sensor. The MIN-point can be lifted by placing a limit stop for the floating ball inside the flowmeter.
- Switch on the power supply for the electronic controller. According to the set retardation of time, the red LED of the electronic controller FA-1.. is beaming - alarm situation.
- Bring the floating ball by feeding of gas through the light ray of the flow alarm sensor from the down position to a position above the sensor head.
- According to the set retardation of time (s. 13.1), the green LED of the electronic controller is beaming - O.K. situation. On the pre-amplifier **K-FA-H** with mono-stable function, the red LED is beaming in O.K. situation, the green LED has no function and is always beaming.

The flow monitoring system is ready for operation now.

### 13.1 ALIGNMENT OF THE DELAY TIME

Unintentional alarms in case of pulsating gas flow can be avoided by this function.

Slow operation: The cutoff of the alarm is delayed (ex works 3 sec.).

Slow release: The alarm release is delayed (ex works 2 sec.).

The alignment of the delay time is described in manual 5-6.10ME, chapter 14.3.

### 13.2 ALIGNMENT OF THE SENSITIVITY

If in case of alarm no alarm message is set off, an incorrect adjusted sensitivity could be the reason. In case a complete control system consisting of sensor, light guides, pre-amplifier, electronic control and flowmeter is ordered, the alignment is made at works. In case the client orders single components for assembling and the alarm function does not work with other measuring glasses, the adaptation can be effected.

The alignment of the sensitivity is described in manual 5-6.10ME, chapter 14.2.

## 14 MAINTENANCE



**NOTE!**

**Before carrying out any maintenance or repair work, the specific safety procedures pertaining to the system and the operational process have to be observed!**

The flow control units series **FA**<sup>®</sup> are functioning without necessity of maintenance over a long time. It may be that the LED and the phototransistors of the flow alarm sensor **FA-2H** must be cleaned due to dust deposits.

Please execute this cleaning with a dry cotton bud (Q-tip). If you want to humid this cotton bud, do only use water !

In case the measuring glass of the flowmeter is dirty, it must be cleaned so that the necessary light transmission is granted.

If there is any defect on the electronics, please return the device for repair to **M&C**.

## 15 ANNEXE

- Circuit diagram **K-FA-H**



For further product documentation, please see our internet catalogue:  
[www.mc-techgroup.com](http://www.mc-techgroup.com)

- Operating manual flow alarm sensors and electronic controllers series **FA**<sup>®</sup>, 5-6.10ME

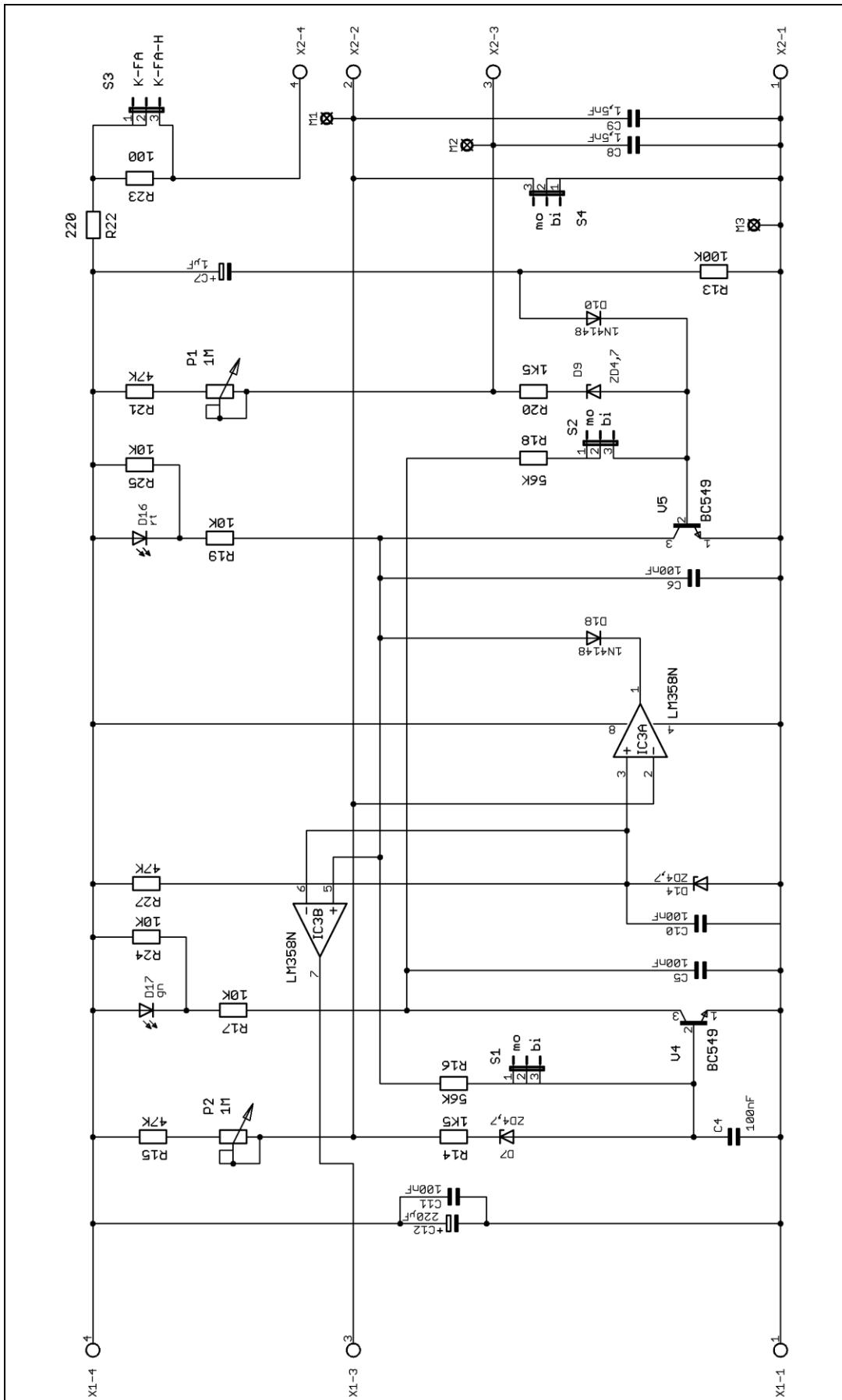


Figure 4 Circuit diagram of electronic K-FA-H 115/230V