



ELECTRONIC CONTROL UNIT
FOR DETECTION & SUPPRESSION SYSTEMS

AF 200

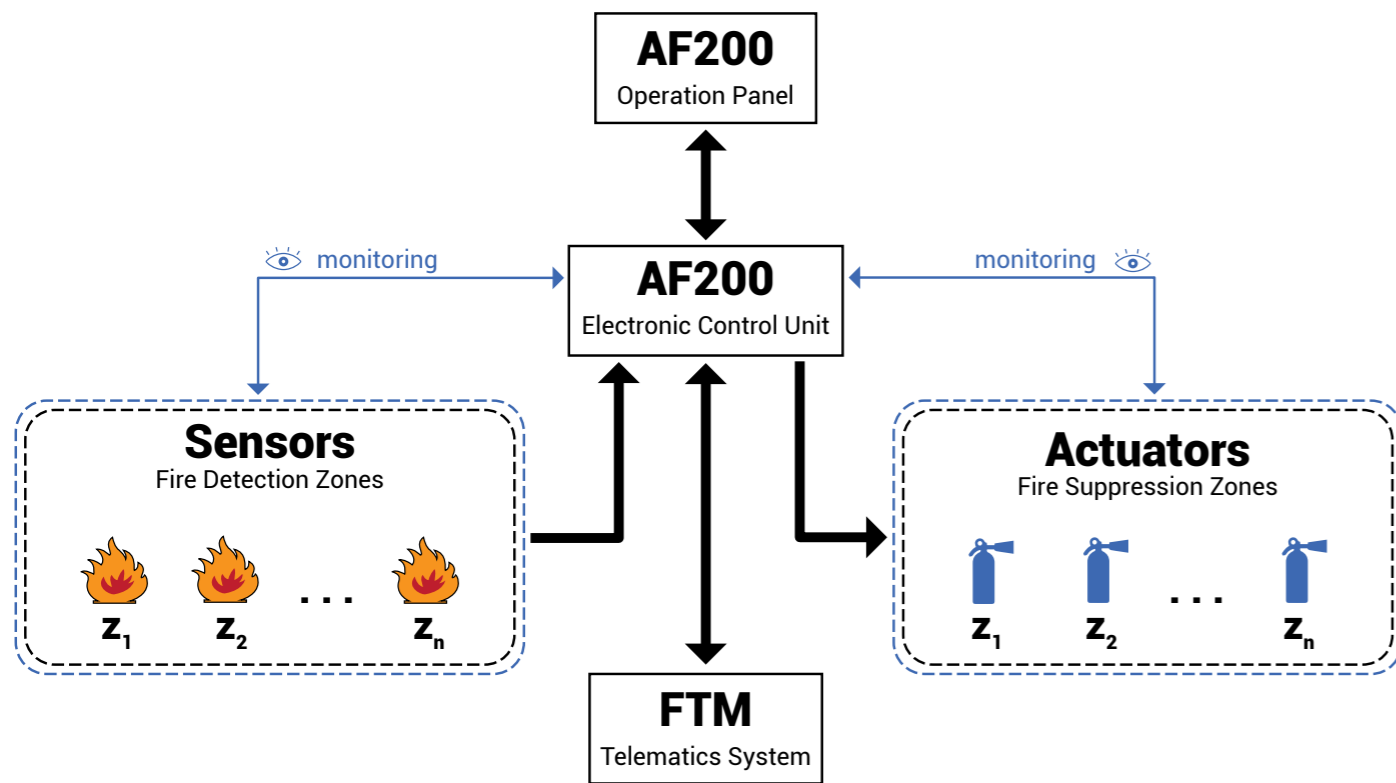
ITEM-NO.: AF200
DATE: 25.11.2015
AUTHOR: H. NASS
TRANSLATED: S. WALSH



1. INTRODUCTION

We are reliable partners for the rapid development and distribution of services and products in the field of Thermo Technology. We bring German engineering to life with our products that react reliably and efficiently. The electronic control unit, AF200 with fire alarm display, is firedirect's own innovative solution. Making its world

debut at Busworld 2015, this newly developed system was nominated for an "Innovation Award", launching firedirect as a pioneering think-tank, bringing experience and efficient solutions to Technology Management in the field of Thermo Technology.



Our control unit and regulatory electronics are part of a modular system, designed for fire detection and suppression in vehicles. As part of a modular system, each component can be selected and every system tailored specifically to suit individual needs. In the broad field of temperature sensor solutions for fire detection and suppression, there are many options for detection and extinguishing components (water mist, foam,

aerosol, etc.), and many systems are a combination of one or more components. firedirect's control unit AF200 is the interface between sensors and actuators, and integrates easily with a diverse array of optional components, which include the fire alarm display to alert the vehicle operator of any issue and the telematics unit, which can transmit GPS data and alert local response teams of any fire incident.

2. CONTROL UNIT AF200

The control unit AF200 is the central element of a fire fighting system. It monitors target zones - the areas with the highest risk of fire - and processes all the signals received from the detectors. Vehicles are divided into several zones that are connected to the control unit via sensor chains and are continuously monitored. Multiple parameters for detection and suppression can be defined and the software can be programmed to respond to a specific event, for example as a response to a heat detector in the engine, or manually by pressing a button in the driver's cab. Self-monitoring parameters can be defined so the vehicle operator will be alerted with system status updates or issues during operation (e.g. cable break). Any operational issues will be diagnosed and stored in the memory function of the electronic control unit. The pressure of the extinguishing agent is continuously monitored and any deviation will be reported and is

easily corrected by adjusting to the set value on the solenoid valve. This additional safety measure provides added confidence in the security of your system. Every incoming status update will cause the control unit to react. This reaction will be defined in the planning phase based on client specifications. The electronic control unit can be precisely programmed and adjusted to meet the individual needs of the client and industry it is serving. Status and events are logged and stored in the NVRAM of the controller and can be reviewed, even in the event of heavy damage. Through this technology, it is possible to identify the exact time, location, and conditions of the event that triggered the system. The AF200 is can also be integrated into the CAN interface, opening future options for protection under the UN / ECE R107 regulation, for example a shutdown of ventilation, motors, or fuel supply.

2.1. CONTROL UNIT AF200 TECHNICAL DATA

- ✓ OPERATING VOLTAGE RANGE: 9 V TO 30 V DC
- ✓ VOLTAGE FOR CIRCUIT MAX. 35 V
- ✓ STANDBY CURRENT 10 MA TO 20 MA
- ✓ CURRENT FOR CIRCUIT 5-10 MA
- ✓ OPERATING CURRENT MAX. 50 MA AT IGNITION
- ✓ PROTECTION AGAINST POLARITY OF POWER SUPPLY
- ✓ OPERATING TEMPERATURE RANGE -25 °C TO 105 °C
- ✓ OUTPUT SHORT-CIRCUIT PROTECTION
- ✓ INGRESS PROTECTION IP 67

SYSTEM ADVANTAGES

- ✓ MODULAR SYSTEM DESIGN
- ✓ COMPATIBLE WITH ALL FIRE DETECTION SENSORS
- ✓ COMPATIBLE WITH ALL SUPPRESSION SYSTEMS AVAILABLE ON THE MARKET
- ✓ DIAGNOSTIC FUNCTION AND FAULT MEMORY
- ✓ CAN-BUS MODULE
- ✓ LIN-BUS FOR NETWORK SENSORS AND VALVES
- ✓ E-CERTIFIED ELECTRONIC COMPONENTS
- ✓ FAST SOFTWARE ADJUSTMENT TO CLIENT NEEDS
- ✓ EASILY CUSTOMIZABLE HARDWARE AND SOFTWARE
- ✓ OEM BRANDING ON REQUEST



3. HMI DISPLAY AF200



HMI Display AF200

The HMI Display AF200 was designed for installation in buses to visually monitor the status of three separate zones. In addition to these three zones, the green LED indicates the function standby during operation. The orange "warning" LED, will indicate an error state (e.g. low pressure in the extinguishing agent or a broken sensor chain) when signaling. An audible alarm can be heard in addition to the visual signals in the case of error or event. The audible alarm can be silenced without affecting the visual alert. The "Test" button can be used

to test all LED lights and alarm functions.

The suppression system can be activated by pressing the red „FIRE“ button. The system can be programmed to discharge in selected or all zones, based on client requirements. The discharge of extinguishing agent can also be delayed by any amount of time, in the event of an accidental activation. All functions of the HMI Display AF200 are completely customizable and software can be configured to individual specifications.

3.1. SYSTEM ADVANTAGES

- ✓ MODULAR SYSTEM DESIGN
- ✓ LIN-BUS CONNECTIVITY
- ✓ E-CERTIFIED ELECTRICAL COMPONENTS
- ✓ COMPACT DIMENSIONS
- ✓ OEM BRANDING ON REQUEST
- ✓ ALL FUNCTIONS CAN BE CUSTOMIZED

3.2. HMI DISPLAY AF200 TECHNICAL DATA

- ✓ DISPLAY FOR INTERIOR INSTALLATION
- ✓ OPERATING VOLTAGE SUPPLIED BY CONTROL UNIT
- ✓ STANDBY CURRENT 10 MA TO 20 MA
- ✓ OPERATING CURRENT MAX. 50 MA AT IGNITION
- ✓ OPERATING TEMPERATURE RANGE -25 °C TO 85 °C
- ✓ INGRESS PROTECTION IP 52

4. FEATURES

- 2 Thermal switch sensor circuit for 2- and 3-wire technique with and without end of line resistor.
- Circuits can detect cable breaks, short-circuits, sudden variations in voltage, and parasite resistors from sensor damage, corrosion and/or exposure to elements of the circuit wires
- Each sensor circuit has an individual (1 A persistent current, 5 A up to 10sec.).
- Each sensor circuit has an optional high power (5A persistent current, 10A up to 10 sec. e.g. for Pyros).
- The outputs are short-circuit proof, have overload protection with protection against extreme temperature and voltage variance.
- Short-circuits and electrical overloads are reported to the CPU for each individual output
- The output load is cyclically monitored with a 4mA pulse. This allows a monitoring of the loads and contacts. Any load or contact failure will be detected and reported for each individual circuit.
- All outputs and their functions can be individually programmed and used.
- A control unit with buttons for „FIRE“, „Test“, „Silence“ und 6 LEDs are controlled by 3 output lines from the AF200 (Standard LEDs are: power, warning, alarm 1, alarm 2, and alarm 3). The LEDs can be customized individually by the software program.
- Alarm beeper is in the control unit.
- Output for an external signal, which is controlled by the alarm.
- Each sensor circuit has a separate input for an external emergency trigger button.
- Each sensor circuit has a pressure sensor input.
- CAN for diagnosis and vehicle connectivity.
- LIN Master for future sensors, etc.
- NVRAM for loss-free data collection and storage.
- Undervoltage detection
- Overvoltage protection
- Inverse-polarity protection

5. DESCRIPTION

The sensor circuits are connected at the inputs SxA, SxB, and SxC. Each of these input channels is equipped with its own analog measuring device. For every measurement, the respective sensor circuit is first verified to check if it can provide error-free data. With this function, wiring, connectors, and sensors are checked for the plausibility of open and short circuits, shunts, and resistance. If the sensor circuit detects any

plausible values, they are compared with the stored data field. If a trigger event is detected, the CPU will react according to the action predetermined and programmed by the client.

5.1. SELF DIAGNOSIS

The AF200 monitors the sensor circuits and actuators for disturbances (cable breaks, short-circuits with ground or supply voltage). All interferences are reported by the control unit (warning light).

5.2. SOFTWARE

The software is written in C++ and fully owned by the firedect GmbH. The software can be customized to your specific requirements.

5.3. ANALOG INPUTS

Three sensor circuits (2 x fire and 1 x smoke) can be connected to the analog inputs. A total of eight analog inputs, S1A to S1C, S2A to S2C, S3A and S3B, measure voltages from 0V to 35V. The inputs are designed to withstand harsh conditions and are fitted with appropriate filters to provide protection against overvoltage and inverse-polarity.

5.4. DIGITAL INPUTS

| | |
|-----------------------|---|
| TYPE A: | KL15, RES1, EEX1, EEX2: Detection ON above 7.4V. Detection OFF below 5.5V |
| TYPE B: | Alarm Display SILENCE, TST/RES, EMINT: Detection ON above 6.5V. Detection OFF below 4.2V |
| TYPE C: | (Pressure switch test voltage 35V): DS1, DS2: Detection ON above 9.8V. Detection OFF below 6.3V |
| INPUT KL15: | Erkennt die eingeschaltete Zündung. Gerät geht vom Stromsparbetrieb in den Dauerbetrieb. |
| INPUT KL30: | Power supply from battery. Always positive |
| INPUT KL31: | Power supply from battery. Always negative |
| INPUT KL15: | Detects the ignition point. Control unit goes from power safe mode to operation mode. |
| INPUT RES1: | Connection for monitoring magnetic solenoid valve. |
| INPUT EEX1: | Input external emergency button. Fire suppression limited on Zone 1 will be triggered. The button is connected to KL30. |
| INPUT EEX2: | Input external emergency button. Fire suppression limited on Zone 2 will be triggered. The button is connected to KL30. |
| INPUT SILENCE: | Button from Control Unit, Silence |
| INPUT TST/RES: | Button from Control Unit, Test/Reset |
| INPUT EMINT: | Button from Control Unit, Fire. |
| INPUT DS1: | Input pressure switch for Circuit 1 |
| INPUT DS2: | Input pressure switch for Circuit 2 |

5.5. OUTPUTS

OUTPUT UV1:

Alarm output for sensor circuit 1. Short-circuit protection, overload protection, thermal protection. 1A persistent current, 5A for up to 10sec. In case of short-circuit/overload, an error on Signal STI1 is signaled to the CPU. With the analog input UV1 the voltage on the load (e.g. valve) is measured (UV1I). To measure the load, a predefined current is sent through the output. A circuit break or similar changes the measured voltages. If the measured voltage lies outside of the predefined boundary, an error is detected.

OUTPUT UV2:

Alarm output for sensor circuit 2. Short-circuit protection, overload protection, thermal protection. 1A persistent current, 5A for up to 10sec. In case of short-circuit/overload, an error on Signal STI2 is sent to the CPU. With the analog input UV2, the voltage on the load (e.g. valve) is measured (UV2I). Same function as described in UV1.

OUTPUT UV3:

Alarm output for sensor circuit 3. Short-circuit protection, overload protection, thermal protection. 1A persistent current, 5A for up to 10sec. In case of short-circuit/overload, an error on Signal STI3 is sent to the CPU. With the analog input UV2, the voltage on the load (e.g. valve) is measured (UV2I). Same function as described in UV1.

OUTPUT UL1:

Power-alarm output for sensor circuit 1 (optional). Short-circuit protection, overload protection, thermal protection. 5A persistent current, 10A for up to 10sec. In case of short-circuit/overload, an error signaled to the CPU. With the analog input UL1 the voltage on the load (e.g. valve) is measured (UL1I). Same function as described in UV1.

OUTPUT UL2:

Power-alarm output for sensor circuit 2 (optional). Short-circuit protection, overload protection, thermal protection. 5A persistent current, 10A for up to 10sec. In case of short-circuit/overload, an error signaled to the CPU. With the analog input UL2 the voltage on the load (e.g. valve) is measured (UL2I). Same function as described in UV1.

OUTPUT BINT:

Output for Beeper in Control Unit (can also be used for other processing signals). Short-circuit protection, overload protection, thermal protection. 1A persistent current

OUTPUT BEXT:

Output for external sound alarm (e.g. Alarm 1, 2 & 3 with different sequences for smoke or fire). Short-circuit protection, overload protection, thermal protection. 1A persistent current, 5A for up to 10sec.

OUTPUT RA1:

additional free-programmable output which can be custom assigned. Short-circuit protection, overload protection, thermal protection. 1A persistent current, 5A for up to 10sec.

OUTPUT LED1, LED2, AND LED3:

Push-pull outputs for LED matrix in the control unit. With the 3 output lines, up to 6 LEDs can be controlled (i.e. Power: green, Warning: yellow, Alarm S1: red, Alarm S2: red, Alarm S3: red)

5.6. CAN

The CAN-bus can be used to flash and update the software in the field. In addition, the software of the AF200 can be customized according to individual requirements, so that the AF200 can also communicate to other CAN units. System diagnostics and fault memory via CAN is also possible.

5.7. OTHERS

POWER FAILURE PFI:

If the Power supply KL30 goes under a predefined value, the AF200 will turn off. An accidental release of the valves and pyro actuators cannot occur.

POWER SAVING WHEN IGNITION IS OFF:

The alarm circuits are monitored every 10s to reduce power usage in the Standby Mode.

CPU:

Atmel AT90CAN64, 6MHz System clock

NVRAM:

RAM is used to store data in case of a power failure.

CAN:

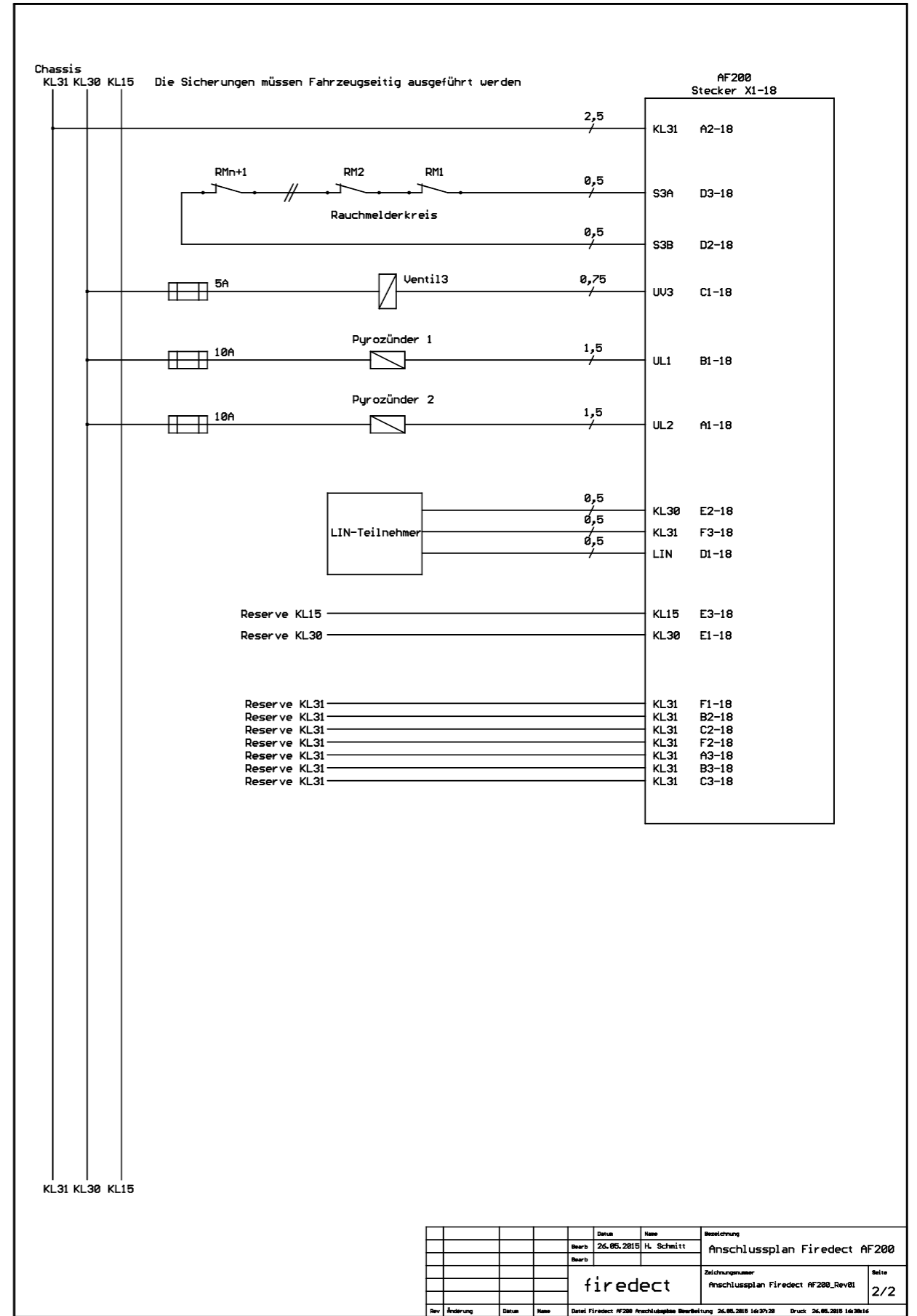
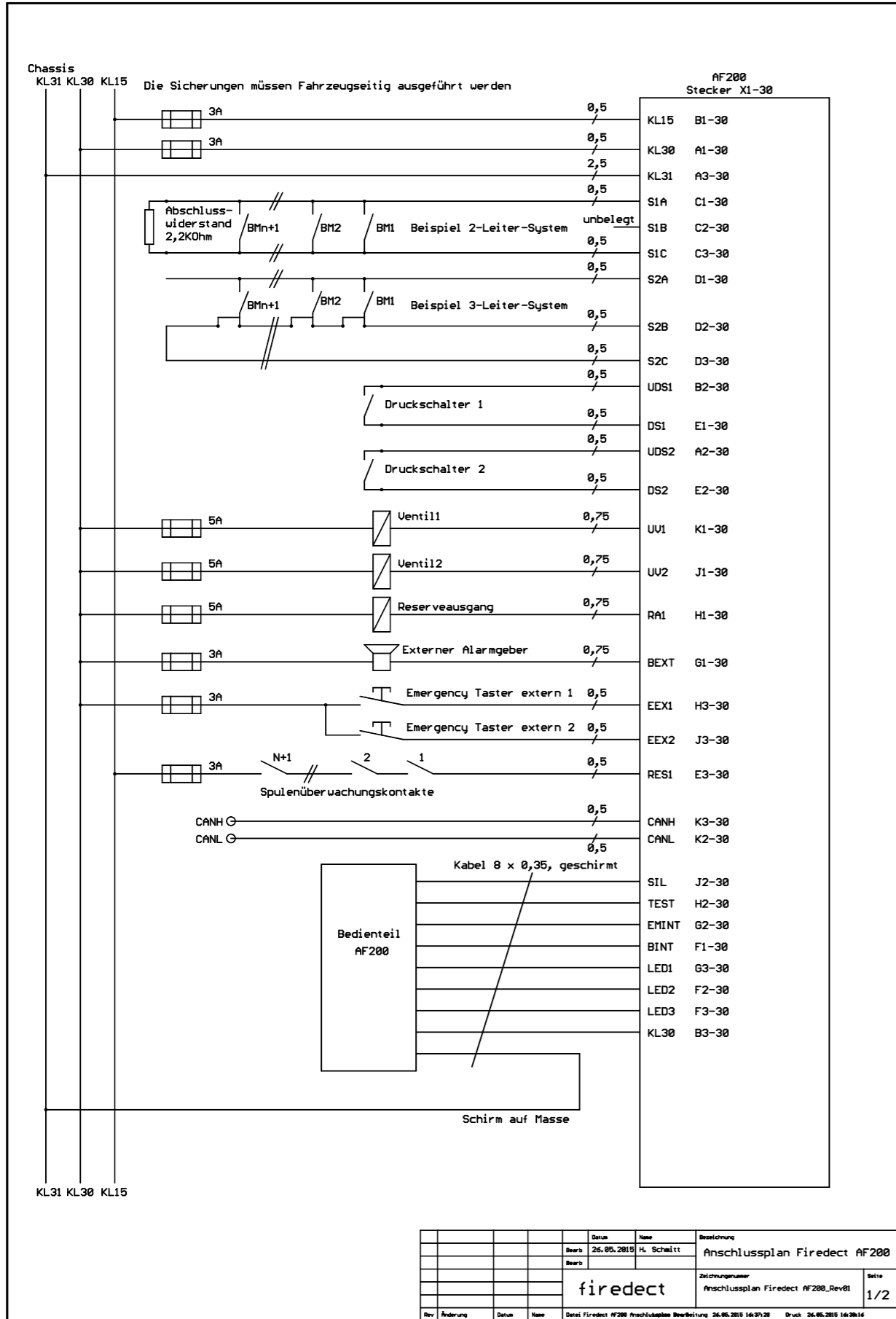
High Speed CAN, ISO 11898-2 compliant, up to 1 Mbit/s. Different types of termination and noise protection are included in the electrical design to prepare for possible OEM-Requirements.

LIN:

Bus Specification 1.3, 2.0, 2.1 compliant to SAE J2602. Transfer rate up to 20 Kbaud.



6. WIRING DIAGRAMS



firedect GmbH

Leibnizstr. 4
72202 Nagold
Germany

T: +49 - 7452 - 929 289 - 0

E: info@firedect.com

www.firedect.com