# Functional Description of the Reader Group

## 1 Reader group: Similarities and differences

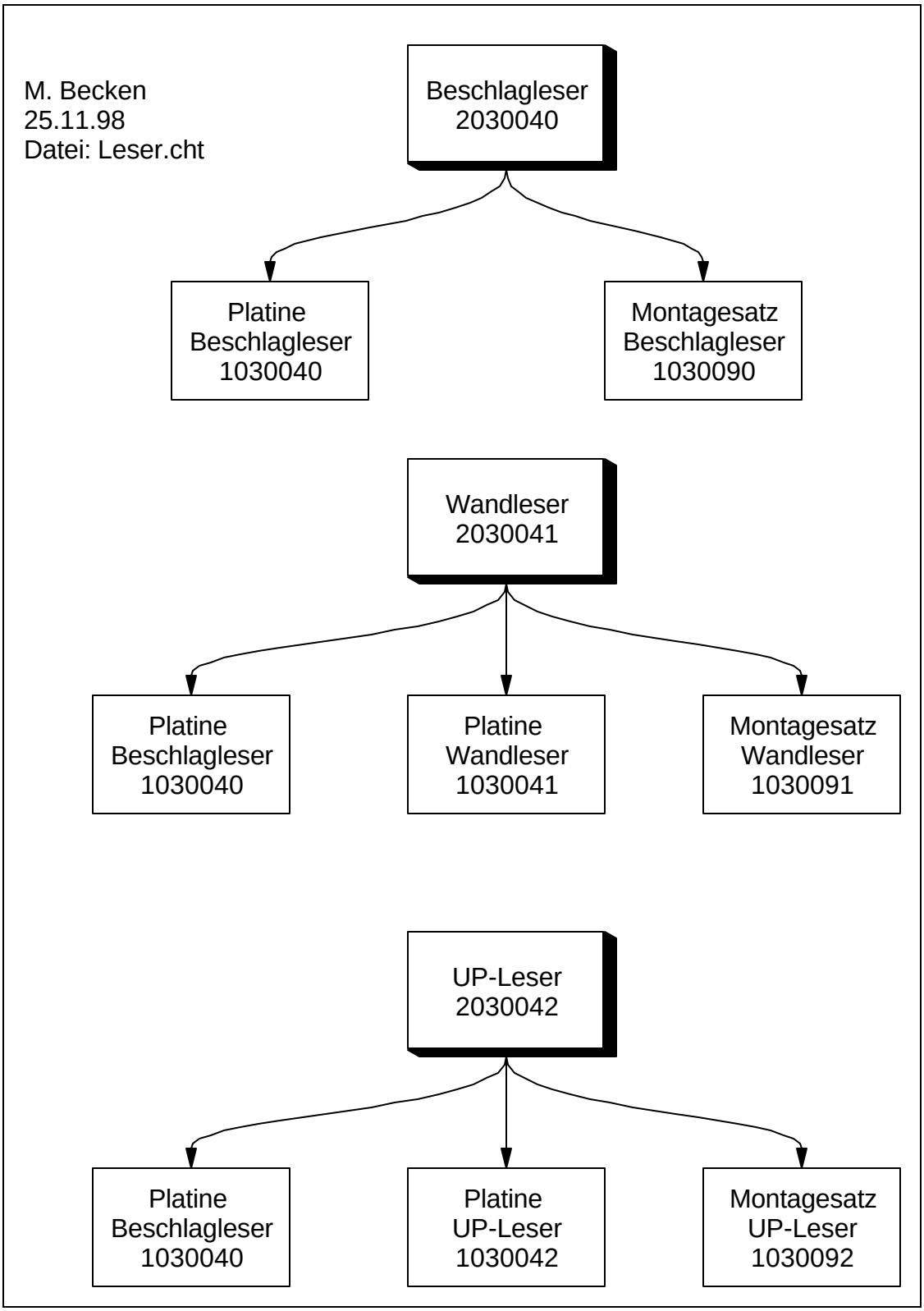
The "reader" product group consists of 3 products:
1. **Armature reader** "ELS-L-BE" for installation in a door armature.
2. **Wall reader** "ELS-L-W1" for mounting on a wall. The reader is mounted on a flush box.
3. **Flush box reader** "ELS-L-UP" for mounting in a flush box.

All 3 readers have the following features in common:
- Functionality
- Hardware for processor, transmitter electronics, power supply and EMC-relevant components
- Printed circuit board for the above-mentioned hardware
- Firmware

They differ in the following points:
- Size of antenna
- Design of the assembly printed circuit board. This assembly printed circuit board is used for adapting fixings and connectors to the individual applications.

Variants:
- ELS-L-BE armature reader: Connection through soldered on cable. Antenna construction requirement: see Appendix
- ELS-L-W1 wall reader: Connection through wall transmitter printed circuit board (1030041). Antenna construction requirement: see Appendix
- ELS-L-UP flush socket reader: Connection through flush reader printed circuit board (1030042). Antenna construction requirement: see Appendix.

The following diagram gives an overview of these connections within the "reader" product group:




Overview of reader group
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| | | |
|---|---|---|
| Armature reader board | | Armature reader mounting set |
| | Wall reader | |
| Armature reader board | Wall reader board | Wall reader mounting set |
| | Flush reader | |
| Armature reader board | Flush reader board | Flush reader mounting set |

# 2 Common components

The components common to all of the products in the reader group are:

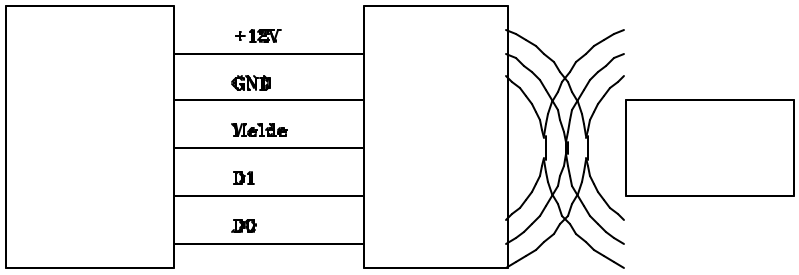
- Functionality
- Hardware for processor, transmitter electronics, interface, power supply and EMC-relevant components
- Printed circuit board for the above-mentioned hardware
- Firmware

## *2.1 Functionality*

The task of the products within the reader group is to provide an interface between host devices and transponders (=contactless identification units). For this purpose, the serial numbers of transponders of the types

- Philips Hitag 1
- Philips Hitag 2
- Deister

are read in and made available to the host computer via an interface.
Via an input (control circuit), the host computer can give the reader instructions for controlling optical (LED) and acoustic (buzzers) display elements, as well as controlling communication with the transponders.




**Melde = Signal**

**HOST Reader Transponder**

### *2.2 Hardware*

The reader group hardware includes the following components:
- Power supply
- EMC protective wiring
- Processor with periphery and security coprocessor (PhilipsHTRC120) for communication with transponders Hitag 1 and Hitag 2.
- Reader electronics around read-integrated switching circuit (Philips HTRC 110)
- Interface with host

The details can be found in the attached wiring diagrams.
The levels of the 5 connection wires are:

| | |
|---|---|
| +12V | 12V to earth |
| GND | Operating earth |
| Signal | Rest level: 12V<br>Active: 0V |
| D0, D1 | Rest level: 0V<br>Active: 12V |

The two carrier boards
- Wall reader board (1030041) and
- Flush reader board (1030042)

support the following components:

- LED for display of operational readiness
- Buzzer as acoustic display element
- Terminals for connecting the device
- Connections for the antenna

### *2.3 Firmware*

The firmware is identical for all products in the reader group. It enables the reader to be operated on two different host computers. The characteristics of these two connections are explained in Chap. 3.
The firmware is permanently programmed into the processor and must not be modified.
Internal processing data are stored exclusively in the processor's own RAM. Function-relevant data do not exist.

Error status are monitored by the following:

- Reset generator monitors the operating voltage and triggers a reset if the operating voltage falls below the reset threshold of 4.5V.
- A watchdog monitors the program sequence. If unforeseen conditions arise within the processor, a reset is triggered within a maximum of 140ms.

As the reader immediately resumes its operation after a reset, no functional failure occurs in the event of a reset status.

# 3 Operating modes

The reader has two operating modes:
1. Reader mode
2. ELS mode

The modes are explained below:

## *3.1 Reader mode*

Mode activation: Switch on the device
Function:
- Reading out the serial number of a recognised transponder.
- Output of the read serial number from D1 and D0 in Wiegand format.
- Monitoring of the signal input for static conditions and control of the LEDs and the buzzer.
- Monitoring of the signal input for known protocols, which activate ELS mode.

## *3.2 ELS mode*

Mode activation: Receipt of a commutation protocol at the signal input
Function:
- Reading out the serial number of a recognised transponder.
- Output of the read serial number from D1. Own protocol is used.
- Monitoring of the signal input for protocols for controlling the LEDs and the buzzer.
- Monitoring of the signal input for known protocols for communication with a transponder

# 4 Displays

2 light diodes and an acoustic signal transmitter are available for user information. The yellow LED on the wall reader is not controlled by the electronics.

In the Pentagon and ELS modes, the display elements take on the following status:

**Pentagon mode:**

The reader principally recognises the status, which it is to display, by the status of the signal input.

| **Status** | **Signal input interface definition** | **Red LED** | **Green LED** | **Acoustic display** |
|---|---|---|---|---|
| | | | | |
| Ready for operation | Rest status | on | off | none |
| Card authorised | negative edge impulse within 100ms; active for 5 sec | off | on, while input is active | short signal (0.3 sec) in the case of negative edge impulse |
| Card not unauthorised or transmission error | Rest status despite sent protocol | off for 1 sec | off | none |
| Antenna interrupted or short-circuited | | Flashes in 0.4-second rhythm | off | Beeping in 0.4-second rhythm |

**ELS mode**

The status to be displayed is signalled to the reader by the switch box through a dialogue.

| **Status** | **Red LED** | **Green LED** | **Acoustic display** | **Comment** |
|---|---|---|---|---|
| | | | | |
| Ready for operation | on | off | none | |
| Card authorised | off | on for ca. 1 sec | short signal (0.3 sec) | |
| Card not authorised or transmission error | off for 1 sec | off | none | |
| Antenna interrupted or short-circuited | Flashes in 0.4-second rhythm | off | Beeping in 0.4-second rhythm | |
| Programming sequence introduced | off (for the duration of the programming sequence) | off (for the duration of the programming sequence) | short signal (0.3 sec) | The programming sequence occurs as described in the Product Requirement Specification document Rel. 2.0 Chap. 2.3.1 |

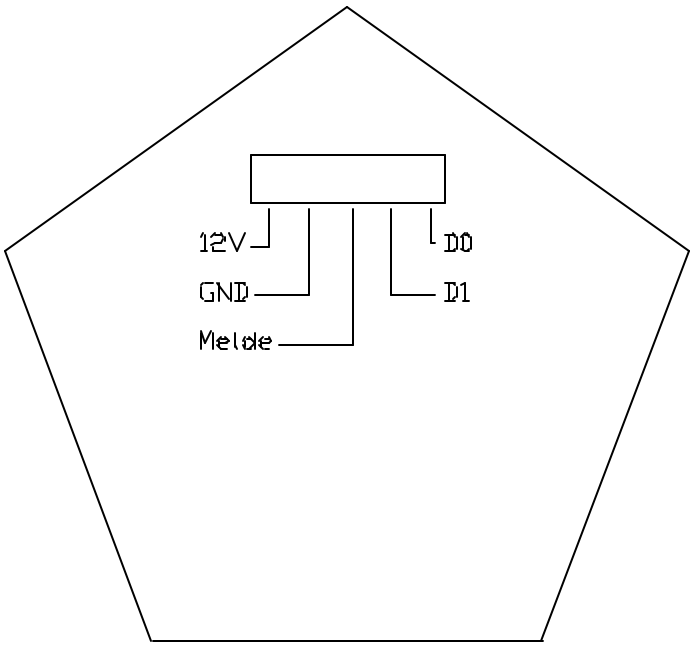
## 5 Pin configuration

The **armature reader is connected** via a 5-pole pin cable with a 5-pin female connector.
The allocation of the cable colours for the connector configuration is as follows:

| **Connector number** | **Cable colour** | **Function** |
|---|---|---|
| | | |
| 1 | red | 12V |
| 2 | black | GND |
| 3 | blue | Signal input |
| 4 | green | Data 1 |
| 5 | yellow | Data 0 |

The **wall reader is connected** according to the following scheme:

| **Terminal number** | **Function** |
|---|---|
| | |
| 1 | 12V |
| 2 | GND |
| 3 | Signal input |
| 4 | Data 1 |
| 5 | Data 0 |




View of back and terminal strip