

## Operating Manual for **DIGITAL+ CONTROL UNIT**

The Operating Manual for the Digital+ Control Unit may only be used in connection with the Operating Manual for the corresponding metal detector.

Therefore, please observe the Usage information in the Operating Manual as well as the general safety information.



Digital+ control unit in stainless steel  
with BD tunnel and belt conveyor



Digital+ control unit in RAL 5005  
with metal separator Y

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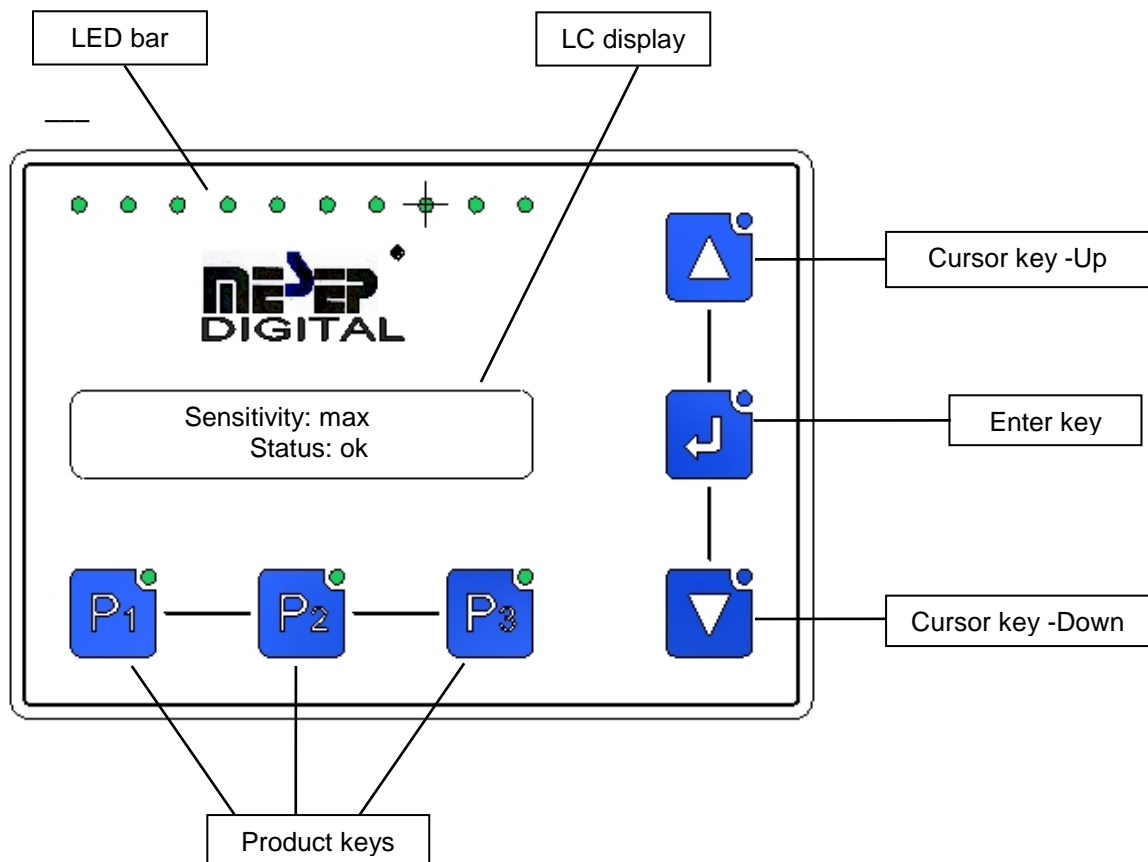
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## Operating elements and displays



**LED Bar:** The LED bar displays the operating state of the device. If the device is ready to operate and no metal alarm is pending, the LED bar is illuminated in green. During activation, if there is a fault or a metal alarm, it is illuminated in red. If one of the menus is opened, the LEDs blink green.

**Liquid crystal display (LCD):** After the activation process, the 20 digit 2 row liquid crystal display displays the main screen with the most important device information. Either the preset sensitivity, the metal counter or the current signal strength can be displayed in the first row. The cursor keys are used to switch displays. The device status (stop, OK, error) is displayed in the second row of the display.

**Enter key:** If one is on the main screen, the belt is started or stopped by activating the Enter key for devices with a belt conveyor; it activates the discharge organ in devices without a belt, such as drop sensors or extractors.

**Product keys:** The product keys are used to select the product. The currently selected product is displayed by an LED beside the respective product key. After pressing the Product key once again, the product is loaded and the LED turns off again. If no product has been 'learned' in the required product memory, a message is triggered on the LCD after choosing the respective product key. The procedure for the 'learning' products is described in the chapter entitled 'Learning products'.

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**Metal alarm:** In the case of a metal alarm, information on the magnitude and phase of the metal signals appears on the first row of the liquid crystal display. The LED bar is also illuminated in red until the metal is ejected. If one of the two ejection exits is set to "Dauer" (Continuous), (only available for belt devices), the message "Metallalarm" (Metal alarm) appears on the LCD along with the request "Quittieren mit Enter" (Cancel with Enter). In this case, the LED bar is continuously illuminated in red. This status remains in effect until the Enter key is pressed. After resetting the metal alarm, the device status is "Stop", i.e. the sensor is non-sensitive. "OK" status is only attained again by pressing the Enter key.

## Basic Menu

The main screen shows the following three different indicators after activation and starting up the electronics:

<b>Metal counter: 0</b> <b>Status: ok</b>	<b>Sensitivity: 90%</b> <b>Status: ok</b>	<b>Signal: 0</b> <b>Status: ok</b>
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The current number of metal alarms is displayed in the first menu. This value is 0 after every activation. The currently set sensitivity is displayed in the second menu. The currently measured sensor signal strength is shown in the third menu in the form of a bar graph. If this bar moves erratically, external interference (e.g. vibrations, electrical interference fields or products with conductivity) are being registered.

The cursor keys are used to switch between the individual displays.

One accesses the Main Menu from the main screen by pressing the Up/Down cursor keys simultaneously. This status is indicated when the LED bar blinks in green. Pressing both these keys again simultaneously takes you back to the main screen.

The following two displays are in the Basic Menu.

<b>Metal counter: 15</b> <b>Total: 3885</b>	The first display shows the totals counted by the metal counter. The current counter count since the last activation or the last resetting of the counter is displayed in the first row. The Enter key is pressed to activate a Reset. The current value changes over into a blinking status while this is occurring. The counter is reset by pressing the Up cursor key. The Reset procedure is only completed after pressing the Enter key again. The total count for all the metal alarms is displayed in the second row. This value cannot be reset. One arrives at the second display by pressing one of the two cursor keys.
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<b>Sensitivity: 90%</b> <b>Signal:</b>	This display shows the currently set sensitivity. Changing the sensitivity occurs by pressing the Enter key, so that the currently set value blinks. Pressing the cursor key UP (to a maximum of 100%) increases the value. The value is decreased by pressing the cursor key DOWN (to a minimum of 1%). Setting the sensitivity (responsiveness) is ended by pressing the Enter key once again. The second row displays the currently measured sensor signal strength in the form of a bar graph.
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## Expanded Menu

The basic menu described previously is sufficient for everyday use. The Expanded Menu is intended for initial commissioning or for further modifications. One gets to the Expanded Menu from the Basic Menu by pressing the Enter key and the two Cursor keys at the same time. The following display appears:

**Password:**  
000

One can reach the Expanded Menu by entering the password **154** using the Product keys P1 – P3 and then subsequently pressing the Enter key. The password cannot be altered. To prevent misuse and incorrect entries, this password will only be given to the persons responsible for this. Returning to the Main Screen occurs by pressing the two Cursor keys simultaneously or if no entry is input for one minute.

With the exception of the two displays, which are already available in the Basic Menu, one can call up the following displays and modify the values accordingly by pressing the Cursor keys. Pressing the Enter key brings one to Change mode. The values are increased by pressing the Up cursor key. The values are decreased by pressing the Down cursor key. Pressing the Enter key again takes one out of Change mode once again.

**Ejection delay:**  
1000 ms

The Ejection Delay shows the time which passes between detection and the addressing of the discharge unit. This can be used to adapt to various geometries. The Ejection Delay can be set in the range between 0... 1000 ms in increments of 100ms and in the range between 1000..10000 ms in increments of 1000 ms.

**Ejection1:**  
1000 ms

The Ejection 1 time indicates how long the corresponding discharge unit will be addressed. The ejection time can be set in the range between 100.. 10000 ms in increments of 100 ms. With belt units, there is the additional possibility of permanently initiating ejection. Resetting the metal alarm is then done by pressing the Enter key. The duration is set by pressing the Cursor key DOWN at the value of 100 ms in Change mode.

**Ejection2:**  
1000 ms

With Ejection 2, there is the possibility of addressing a second discharge unit. This possibility is used, for example, with extractors. Here, Ejection 2 is used to address a blow-off valve, which conveys the granulate containing the metal more quickly to the ejection flap, for a shorter time while Ejection 1 addresses the ejection flap with a longer holding time. Setting the values for Ejection 2 is done in an identical fashion to the time for Ejection 1.

**Ejection monitor:**  
off:

To control the correct function of the discharge unit, an ejection monitor may be available. This display can be used to activate or disable the ejection monitor. The ejection monitor can only monitor Ejection 1.

**Language:**  
German

Various languages are available for the User Menus: Currently, the menus are available in the following languages: German, English, Italian, Spanish. Depending on the selection in this display, all the information that is output on the display will appear in the selected language.

Ejection filter:  
off:

If the intense mechanical bouncing of the discharge unit results in additional metal alarms being triggered, this can be avoided by activating the ejection filter. In Mode 1, bouncing is filtered when ejection is activated. In Mode 2, bouncing is filtered when the ejector is switched on or off. The sensor sensitivity may be lower in this mode at the moment in which the metal is being transferred out.

Vibration filter:  
on

If intense mechanical vibrations (e.g. when belt or drive unit starts up) result in additional triggering of metal alarms, these can be filtered out by activating the vibration filter. When the vibration filter is activated, the sensor sensitivity may be lower under some circumstances.

Learning vibration  
phase

In order for the vibration filter to function correctly, the vibration phase must be set correctly. This value is already set to the optimum setting at the factory and is therefore only changed under exceptional circumstances. In the event that the vibration filter delivers inadequate results as a result of changes to the device (e.g. mounting onto a conveyor belt), then this can be 're-learned' or reprogrammed.

Learning vibration  
phase xx%

The 'learning' or re-programming phase is started by pressing the Enter key. No product may pass by the sensor during the 'Learning' (reprogramming) phase. The necessary data is gathered by 'knocking' on the device or by activating the error source during the Learning process. If no data is recorded during the Learning process due to a lack of vibrations, then the vibration filter is faulty. The Learning process takes approx 30 s. The Learning progress is displayed as a percentage (0..100%).

## Service Menu

Using the Service Menu is only necessary by the customer in absolutely exceptional circumstances. This could be, for example, if one is attempting to check whether the preset sensor frequency is correct or if the electronics on a new sensor have to be set/adjusted. **If unauthorized changes are performed to the settings here, this can result in the fact that the device will no longer operate properly or that it can even be ruined.** One gets to the Service Menu from the Basic Menu by pressing the Enter key and the two Cursor keys at the same time. The following display appears:

Password:  
000

One can reach the Service Menu by entering the password **772** using the Product keys P1 – P3 and then subsequently pressing the Enter key. The password cannot be altered. To prevent misuse and incorrect entries, this password will only be given to the persons responsible for this. Returning to the Main Screen occurs by pressing the two Cursor keys simultaneously or if no entry is input for one minute.

With the exception of the two displays, which are already available in the Basic Menu and the Expanded Menu, one can call up the following displays and modify the values accordingly by pressing the Cursor keys. Pressing the Enter key brings one to Change mode. The values are increased by pressing the Up cursor key. The values are decreased by pressing the Down cursor key. Pressing the Enter key again takes one out of Change mode once again.

**Vibration phase:**  
89.91°

As a rule, 'teaching' or reprogramming the vibration phase is sufficient. In this display, one has the additional possibility of manually adjusting the vibration phase. The vibration phase can be set in the range between 0.00..359.91° in increments of 0.09°. This value should only be adjusted by the customer after first contacting a service technician.

**Type of operation:**  
Belt unit:

The Digital+ electronics can be delivered with various probes. If the probe is mounted on a conveyor belt, the operation type Belt unit must be selected in this display. A second possibility is that the electronics work with a drop sensor. In that case, the operation type Drop Sensor is selected. The correct operation type is already set in the factory settings, which means that this value does not need to be altered by the customer.

**Sensor frequency:**  
299450 Hz

Every sensor has its specific frequency. This has to be set in the electronics in this display. The possible setting values are between 50,000..650,000 Hz and can be set in increments of 50Hz. The value for the supplied probe is preset at the factory and may not be altered by the user. If the probe has to be replaced, then the corresponding frequency of the new probe must be set in this display. The new frequency should be set while no probe is connected.

**Learning noise threshold**

Every sensor has a noise threshold. The signals below this noise threshold are ignored by the electronics. To define this specific value for every sensor, the noise threshold is reprogrammed ('learned') in this display. The reprogramming process takes approx 15 s. The value of the noise threshold equals 5..15mV. This value is already set at the factory and must not be 're-learned' or re-programmed.

**Noise threshold:**  
5 mV

As a rule, reprogramming the noise threshold is sufficient. In this display, one has the additional possibility of manually adjusting the noise threshold. The noise threshold can be set in the range between 5.. 1000mV in increments of 1mV. This value should only be adjusted by the customer after first contacting a service technician.

## 'Learning' Products

Before re-learning the various products, please take the information in Chapter D, Commissioning, contained in the Operating Instructions for the Metal Detectors, into consideration. Observe the items 'Checking the ambient influences', 'Checking the product for product effects', 'Strong product effect' and 'Minor product effect', in particular.

If the test material inside the detector generates a signal without any share of metal, then this is referred to as a product effect. This effect depends largely on the product itself. If this involves dry plastic granulate, for example, then this effect is negligibly low. If the test material involves damp products with dissolved salt, e.g. meat, this effect is extremely high. This is how you can determine whether your test material has a product effect:

1. Start the device.
2. Work in the empty product, i.e. none of the product key LEDs are illuminated.
3. Watch the detector, there should not be any triggering.
4. Now move your product through the detector and watch the display



- If no signal appears, then the product has no effect
- If signal deflection appears or a metal alarm is given, the product has an effect

In this case, you will have to program the product effect.

**Learning product  
xxs of 60s**

The 'learning' of a maximum of three different products is possible. The programming of the respective product memory area is started by pressing the corresponding key P1, P2 or P3 for approximately 3 seconds. The programming process takes approx 60 s. During this time, metal-free products should continue to be moved through the metal detector. Any product data, that was previously stored in this product memory area, will be overwritten during the learning process. As a result of learning the product effect, it is possible there will be a reduction in the sensor sensitivity under certain circumstances.

## Technical Data

Various values can be shown in the Technical Data, depending on the type of metal detector involved. The first table applies for tunnel detectors, Type BD or TU, if they are mounted on a belt conveyor.

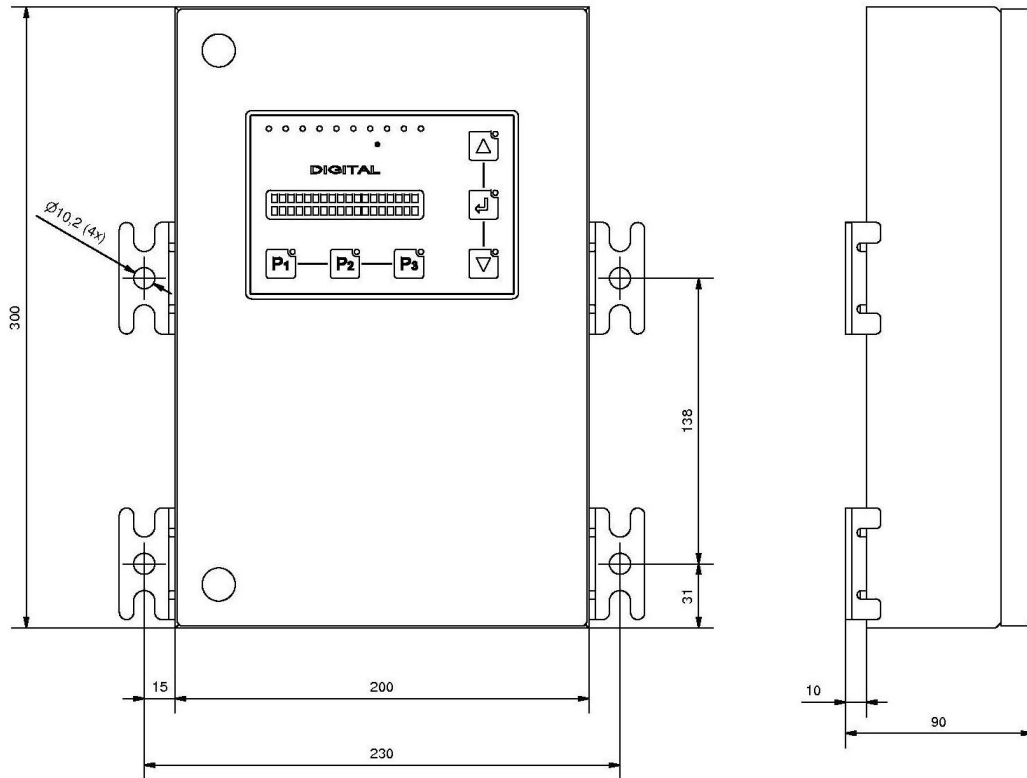
Mains voltage	230 V	Electrical connection cable	H07RNF-F
Mains frequency	50 Hz	Belt speed (depends on type)	5...25 m/min
Capacity (depends on type)	200 W	Operating temperature	+0° to +40° C
Cos $\Phi$	0.98	Storage temperature	-20° to +50° C
IP degree of protection	IP 65	Total mass (depends on type)	50 kg .... 1000 kg
Mains protection	1 x 2 A T	Dimensions (depends on type)	e.g.: 1800 x 700 x 900 mm
Sensor frequency (depends on type)	300 kHz	Pressure	6 bar

The second table applies for metal detectors of Type VA, SE, Y, RG and GF, which are all used as drop sensors.

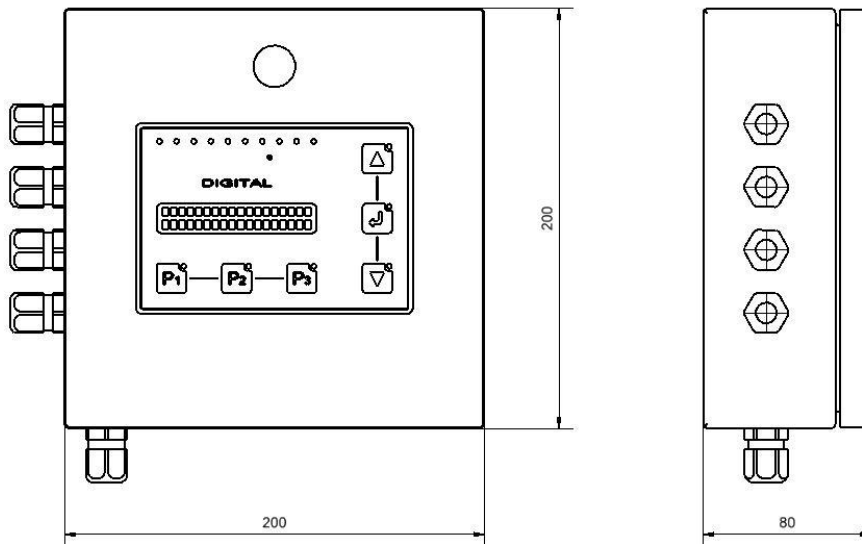
Mains voltage	230 V	Material throughput (depends on type)	300..8200 l/h
Mains frequency	50 Hz	Operating temperature	+0° to +40° C
Capacity	30 W	Storage temperature	-20° to +50° C
Cos $\Phi$	0,98	Total mass	approx. 20 kg
Mains protection	1 x 2 A T	Dimensions (depends on type)	340 x 360 x 410 mm
Sensor frequency (depends on type)	300 kHz	Pressure	4-6 bar filtered, free of water and oil
		Product temperature (with fan cooling)	max. 60° C
		(with compressed air cooling)	max. 80° C
			max. 100° C

## Housing dimensions

In principle, two different housing types are available to you: The housing made of stainless steel, shown below, is used for most applications. There are two mounting alternatives with this housing. The housing is either fastened directly onto the metal sensor or it has an external housing, as shown here, although, as a rule, the distance to the sensor should not be larger than 3 m.



The second housing form, shown in the following drawing, consists of powder-coated black sheet metal in RAL 5005 color. This housing is exclusively used in connection with Type Y metal detectors. This housing is mainly characterized by its compact design.



## Electrical Interface

The following possibilities are provided to link the Digital+ electronics to an external control unit (also see the sample circuit diagrams under the heading Flow Diagrams):

Available inputs: DI15 and DI13

An external key button can be connected to input DI15 (Function key). If there is a conveyor belt function, pressing this button will start or stop it. In addition, it is possible to reset the metal alarm in Continuous Ejection mode. Please bear in mind that after resetting the metal alarm, the sensor is in Stop mode and that the button must be activated again before it will be switched into OK mode.

An external probe can be connected to input DI13 (Ejection monitoring), which monitors the proper movement of the ejection unit. When using the Expanded Menu, it is necessary to activate the evaluation results of this monitoring first.

The voltageless inputs are separated from the internal electronics by means of an optoelectronic coupler. They are configured for a voltage of 24V.

Useable Outputs: DA05, DA04, DA03, DA02 and DA01

The output DA05 (System ready) switches once the device has run up properly after activation and the sensor was successfully aligned.

The output DA04 (System running) switches once the device has run up properly after activation and the sensor was successfully aligned and the sensor is in OK mode. This

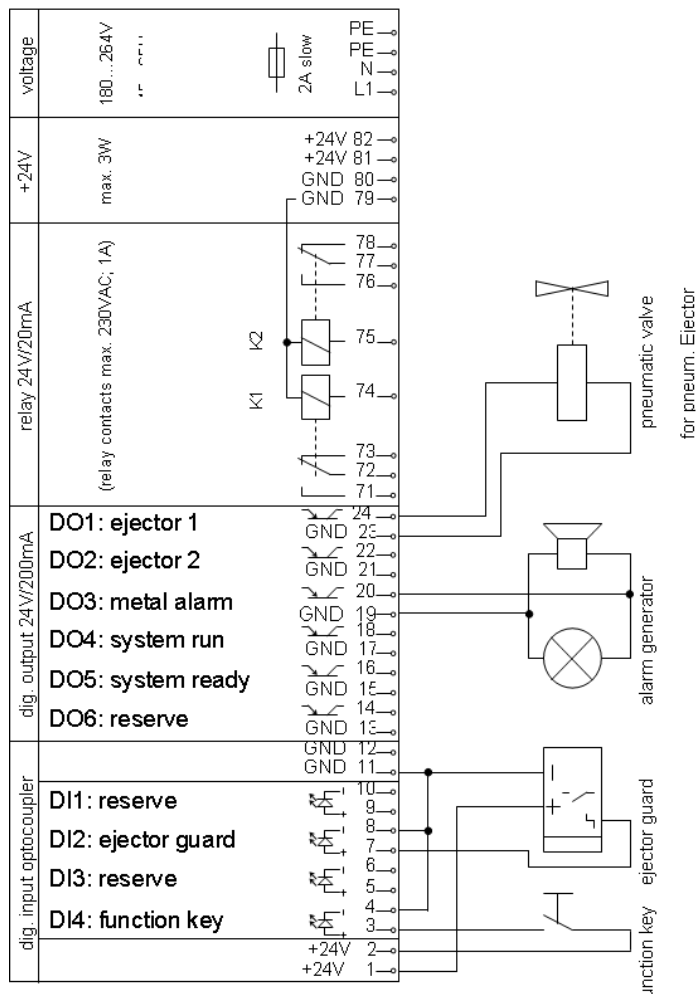
output is connected to relay switch K1 at the factory. Thus, this information can be used for external devices via the relay contacts (230V/1A).

Output DA03 (Metal alarm) can be used to signal metal alarms by using a visual or acoustic signal transmitter. The output energizes immediately after detecting the metal alarm. De-energizing occurs at the same time as de-energizing Ejection 1 or 2, depending on which ones de-energizes later.

Output DA02 (Ejection 2) can be used to address a second ejection unit.

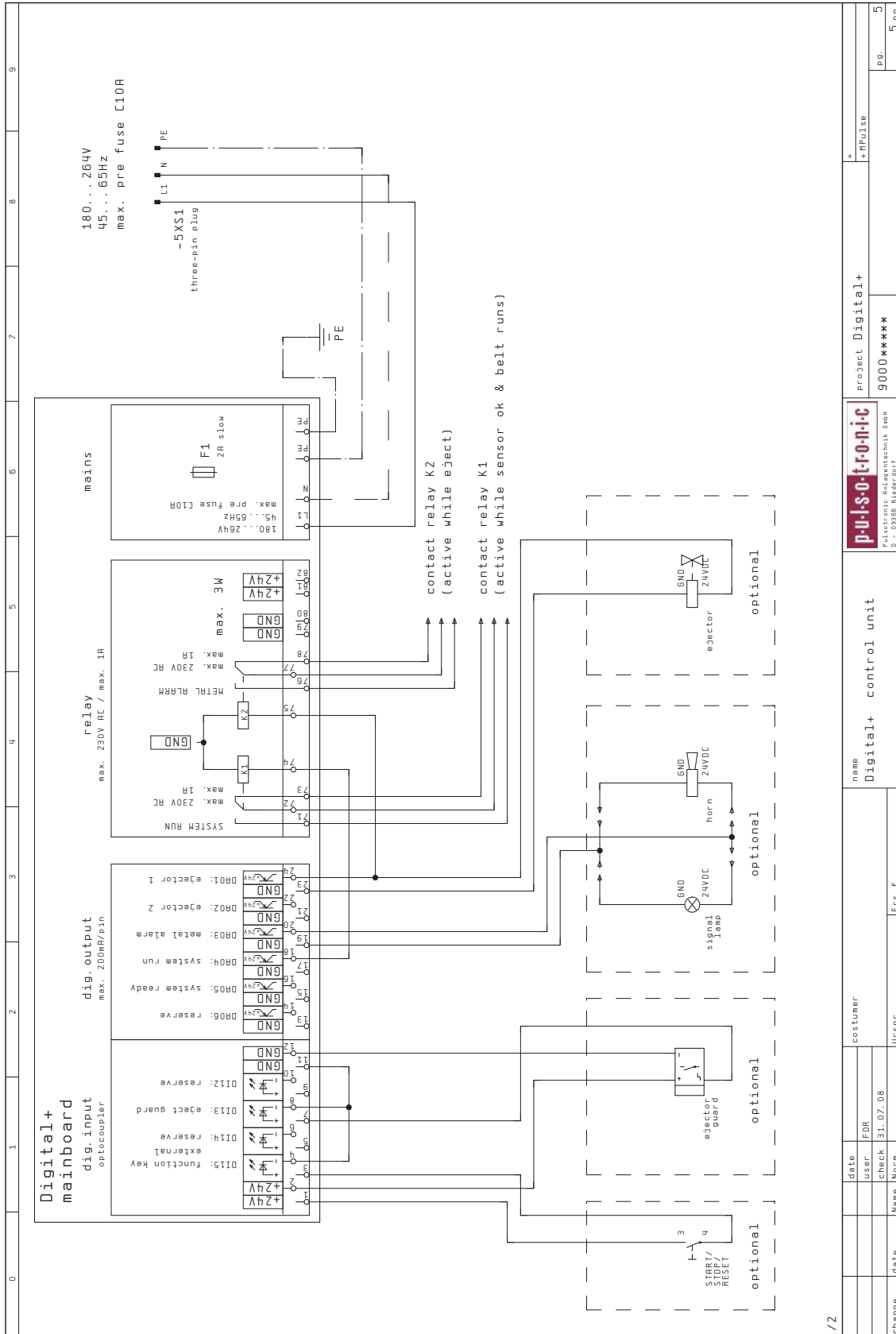
Output DA01 (Ejection 1) is used to address the actual ejection unit. This output is already connected to relay switch K2 at the factory. Thus, this metal alarm information can be used for external devices via the relay contacts (230V/1A). For example, this contact can be used to stop the conveyor belt if no ejection unit is being used.

If additional external devices are connected, it is necessary to ensure that the maximum power of 3 W is not exceeded because of the capacity of the power supply. This means that with a voltage of 24 V, the total power must not exceed 125 mA.



# Circuit diagrams

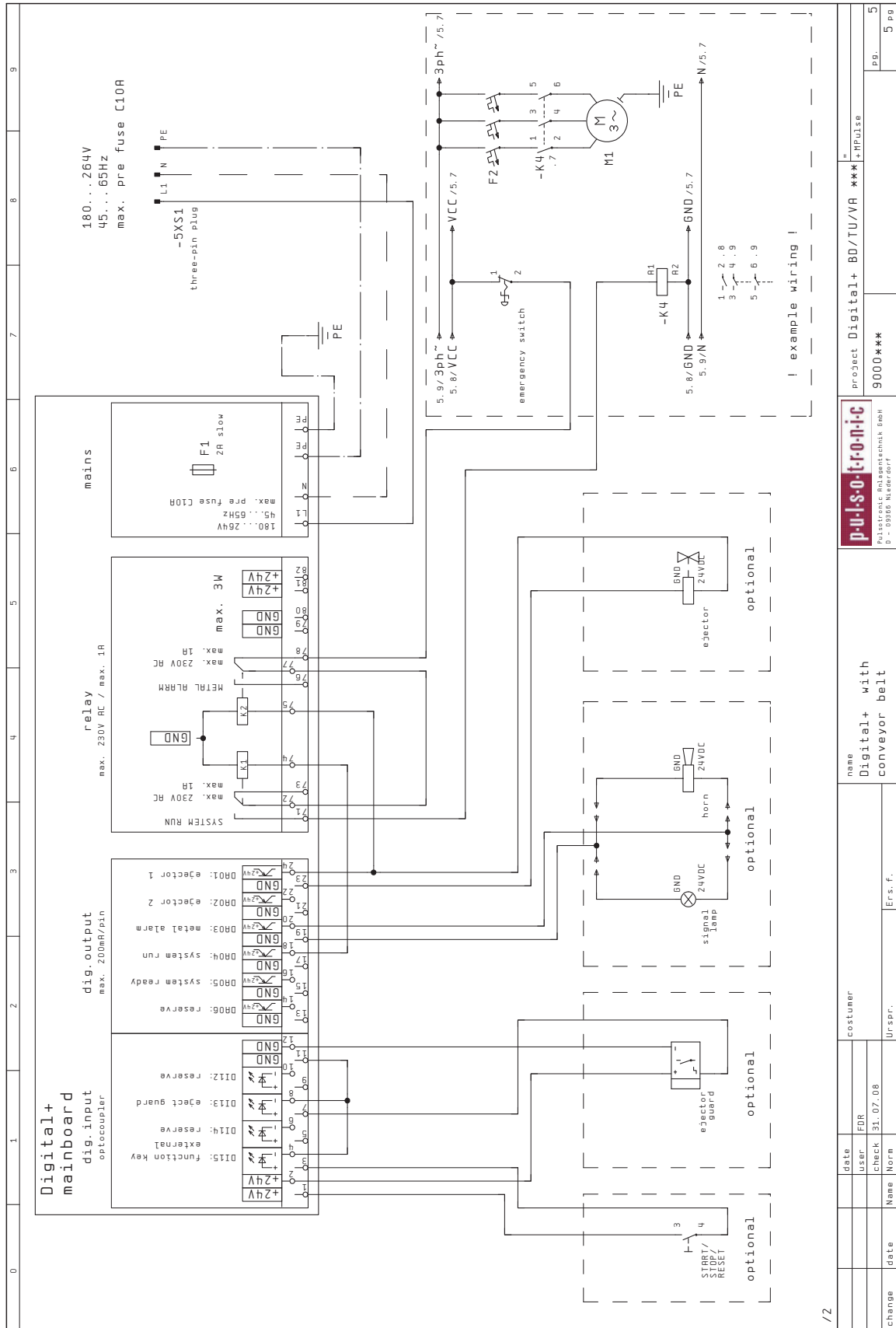
Circuit diagram – standard (e.g. to operate drop sensors)

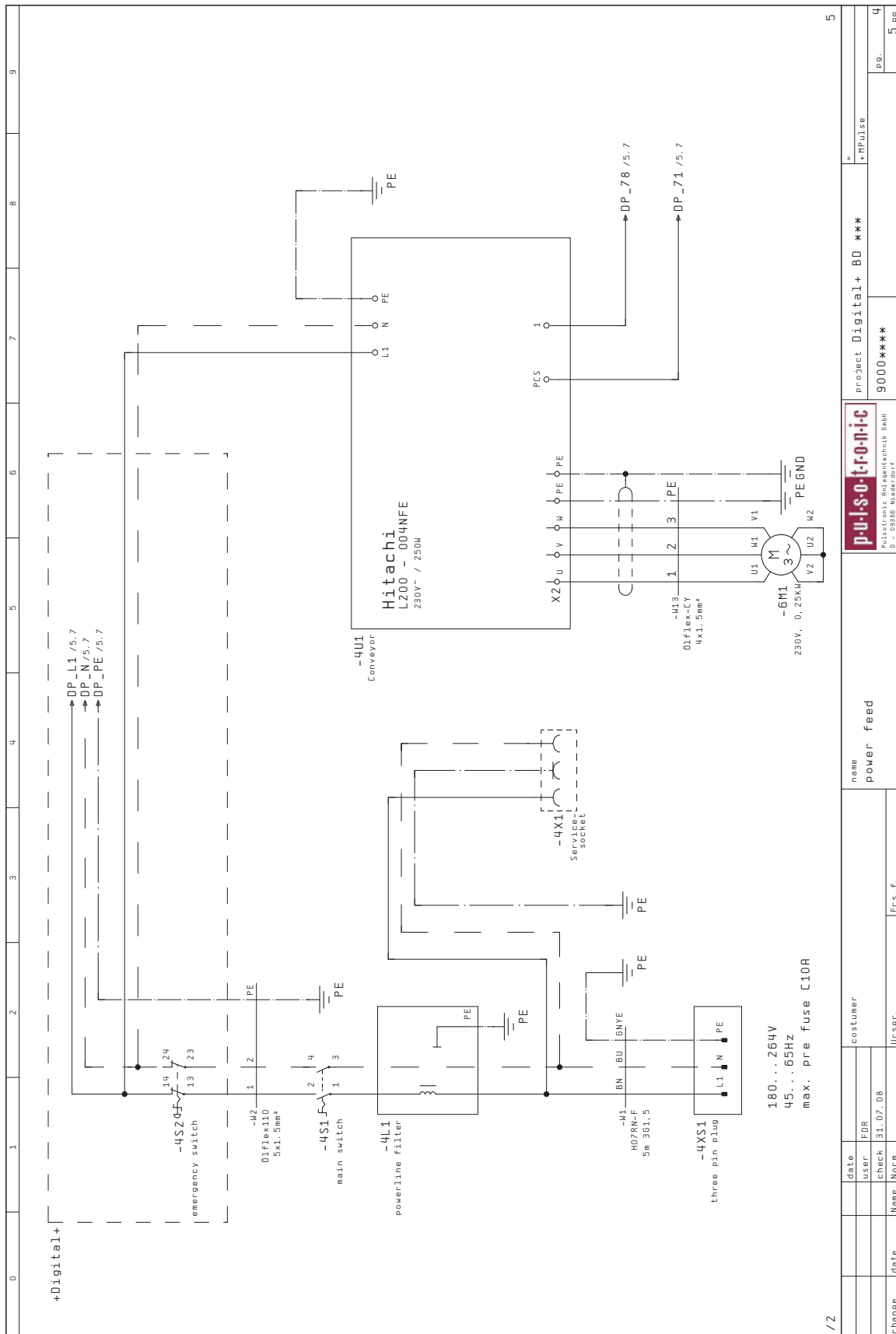


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date		customer		name		Project Digital+		
user	FDR			Digital+ control unit		+MPulse		
check	31.07.08	Urspr.		Ers. f.		9000*****		
change	date	Name		Norm		Pg. 5		
							Pg. 5	

# Circuit diagram with protective circuitry for operation in conveyor systems

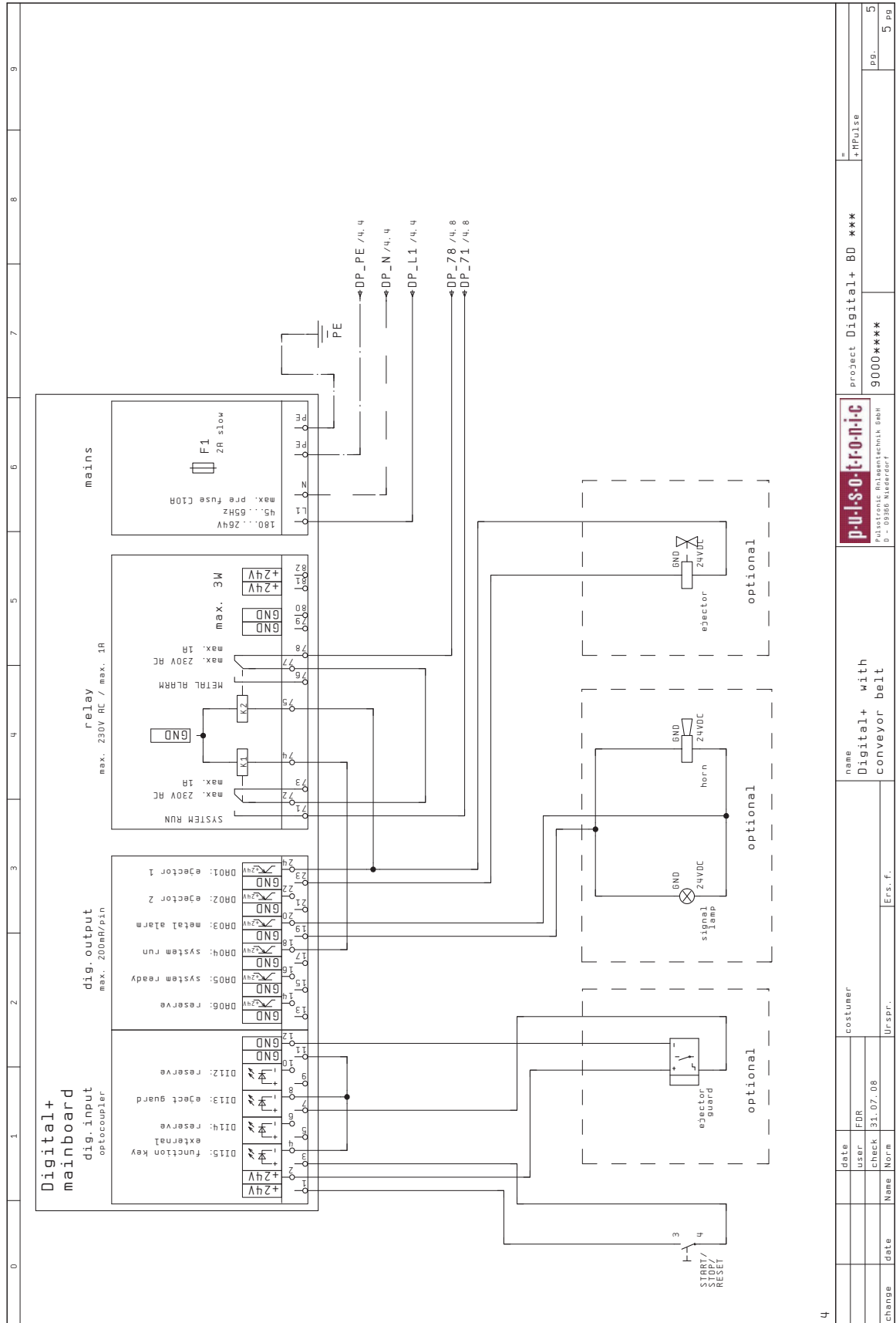




/2

change	date	Name	Norm	Urspr.	Erst. f.	name	power feed	Project Digital+ BD ***	9000***	pg.	4
											5 pg

Circuit diagram with frequency converter for operation in conveyor systems – Page 2/2



date	FDR	customer	name	Project Digital+ BD ***	PPulse	pp.	5
user	Check	ur-spr.	Digital+ with conveyor belt	9000****			
check	31.07.08						
name	Norm						
date							
change							