

# wright

## **Operating Instructions**

**CD 30**

**Frequency inverter for vibratory conveyors  
Incorporating CD30, 31, 32**

**Version H**

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# CD30

VIBRATORY CONVEYOR CONTROLLER

### Technical Safety Information for the User

This description contains the necessary information for the correct application of the product described below. It is intended for use by technically qualified personnel.

Qualified personnel are persons who, because of their training, experience and position as well as their knowledge of appropriate standards, regulations, health and safety requirements and working conditions, are authorised to be responsible for the safety of the equipment, at all times, whilst carrying out their normal duties and are therefore aware of, and can report, possible hazards (Definition of qualified employees according to IEC 364)

### Safety Instructions

The following instructions are provided for the personal safety of operators and also for the protection of the described product and connected equipment.



#### **Warning!**

**Hazardous Voltage**

Failure to observe can kill, cause serious injury or damage

- Isolate from mains before installation or dismantling work, as well as for fuse changes or post installation modifications.
- Observe the prescribed accident prevention and safety rules for the specific application.
- Before putting into operation check if the rated voltage for the unit conforms with the local supply voltage.
- Emergency stop devices must be provided for all applications. Operation of the emergency stop must inhibit any further uncontrolled operation.
- **Electrical connections must be covered**
- **The earth connection must be checked, for correct function, after installation.**
- **After switching off the unit, some internal components will still be charged due to capacitance.**
- **Before opening the unit wait at least five minutes to allow capacitors to discharge.**

### Specified Use

The units described herein are electrical controllers for installation in industrial plant. They are designed for power adjustment of vibratory feed equipment.

The units conform to the directive 89/336/EWG

EMC-Directive **CE**

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## Frequency inverter for vibratory conveyors

### 1.0 General

This microprocessor based controller is used for adjusting the throughput of vibratory conveyors. The unit generates an output frequency for the feeder, which is independent of the mains frequency. The selected output frequency corresponds to the mechanical frequency of the feeder. The optimum frequency can be selected manually or automatically in running mode. In normal operation the frequency remains constant and the throughput relates to the output voltage level. The frequency can be dynamically adjusted to correct for loading during normal running.

The unit can also operate at resonant frequency, when it is used in conjunction with an accelerometer that is fitted to the feeder. Furthermore the feeder will maintain a constant delivery rate irrespective of changing load conditions.

#### Special Features:

Adjustable output frequency independent of mains supply frequency.

Constant feed rate unaffected by mains voltage changes.

Coarse / fine operation or level sensor control.

Automatic frequency search (resonant frequency) during normal operation.

The units can be supplied in chassis form, for panel mounting, or housed in a lockable, IP54, sheet steel enclosure. A mains switch is fitted to the enclosure door.

### 2.0 Function

A touch panel (keys and display) on the front of the unit is used for settings. All adjustments can be made through this panel. The feeder throughput set point can be also derived from a potentiometer, a 0...10 V, DC voltage signal or a 0(4)...20 mA current signal. Parameters are selected and changed by using a menu that is called up by entering a user code. Capital letters are used to indicate the selected functions. A status relay (On/Off) with potential-free contacts brought out to terminals, operates when the feeder is energised.

Coarse/fine switching is controlled from an input signal (contact or 24V).

The feed rate set-point is displayed in % by the front panel LED, during normal operation. In programming mode the parameter symbols and their corresponding settings are displayed.

New settings are saved upon leaving the programming mode or if no keys are pressed for 100 seconds.

#### 2.1 Enable input

Input terminals for contacts	5 and 6
Input terminals for 24 V, DC	4 (-) and 5 (+24 V)

The unit is enabled by closing contacts or by applying a 24V signal.

#### 2.2 External set-point input 0...10 V, DC / 0(4)...20 mA

The parameter "E.S.P." = I must be set for an external set point to be used.

Potentiometer input terminals	7(-), 8(E), 10(+10 V)
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0...+10 V, DC input terminals	7(-), 8(+0...10 V)
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0(4)...20 mA input terminals	7(-), 9(+0...20 mA)
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#### Important!

A minimum level for the output voltage can be selected when an external set point is used (to adapt the set point to give a true minimum vibration of the feeder), this is achieved by setting the internal set point "A" on the display. This must be done before switching on the external set point source, through the controller.

**Should there be no requirement for a zero correction then "A" must be set to "0" before the external set point function is selected.**

### 2.3 Amplitude sensor

An amplitude sensor must be connected before the system can run in amplitude regulation mode..

Input terminals 11 and 12

A screened cable should be used in an industrial environment!

### 2.4 Control input Coarse / Fine (2<sup>nd</sup> set point)

Input for switching to a second set point.

### 2.5 Status relay ON / OFF

Internal relay contact on terminals 14 and 15, (Contact closed = running).

### 2.6 Thermal Contact

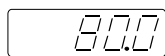
Input for temperature controlling of the vibratory magnets (terminal 51 + 52). If vibratory magnets with temperature control are used the temperature switch in the magnet has to be connected at terminals 51 + 52. On reaching the temperature limit, the thermal contact will open and the unit will shut down with the fault message ERROR ETP. This message can be cancelled by switching the main power off and on or by pressing the "I" button. If the Input isn't used, the terminals 51 + 52 have to be bridged.

### 2.7 External Programming

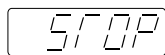
Connector for external programming or running with field bus-systems, e.g. DeviceNet.

### 2.8 Displays

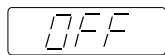
All operating conditions are shown in the touch panel display. The set point in % is displayed during the normal running mode. Other conditions are explained below:-



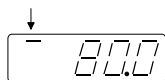
Normal running mode, feed rate in %



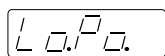
Stopped using the internal "0" key



Switched off using the enable input



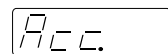
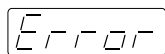
Current limiting active or  
Maximum control range reached



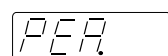
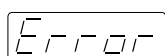
Low supply voltage

#### 2.8.1 Fault messages

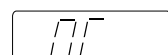
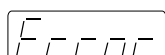
These messages show conditions that cause the controller to switch off !



Amplitude Sensor (e.g. disconnected or broken)



Output overload (RMS), typically caused by increased load or current drawn from control unit



Output overload (peak), typically caused by large air gap or fast reduction of feed frequency

Error

OU

Input voltage too high

Error

EFP

External thermic contact ( Magnet)

Error

OL

Output overload ( e.g short circuit, earth short), unit detected a potentially damaging fault condition at the output stage





### 2.8.2 Error reset


The units power output is switched off in the event of an error message. The “Error” message must be cancelled after the fault has been corrected, in either of the following manners:-


1. Main supply OFF / ON (wait for discharging time of the capacitors)

2.

Code 009 Error

 Error reset

 Error reset and set point "0"

**3.0 Technical Data**

Unit Type	CD30 H	CD31 H	CD32 H
Input voltage	110-120 V...208-240 V +/- 10 %	110-120 V...208-240 V +/- 10 %	110-120 V...208-240 V +/- 10 %
Input frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Output current	Max. 10 A	Max. 10 A	Max. 10 A
Output frequency	15...30 Hz	15...30 Hz	15...30 Hz
Set point source	Display / Potentiometer 10 kR / 0...10 V, DC / 0(4)...20 mA		
Soft start time	Adjustable 0...10 seconds		
Enable input	Contact / 24 V, DC		
2 <sup>nd</sup> set point input	Contact / 24 V, DC		
Status relay	Contact 2 A, 250 V		
Ambient temperature	0...+45 °C		
Storage temperature	-20...+70 °C		
Relative humidity	93 % without condensation or dew		
Altitude	1000 m 0,5 % derating for each additional 100 m		
Contact protection	VBG 4	VBG 4	VBG 4
Enclosure protection	IP 00	IP65 Mild Steel	IP65 Stainless Steel
Standards	EN 50081-2, EN 50082-2		

**3.1 Declaration of conformity**

We declare that these products, as stand-alone equipment, conform to the following standards or subsequent documents: EN 50081-2 and EN 50082-2 in accordance with 89/336/EWG regulations.

## 4.0 Settings

### 4.1 Parameter table

Parameter:		Code	Factory settings:	Entry code:
<b>Feeder</b>				
• Maximum current (Output)	0...100 %	I.	100 %	038
• Amplitude (feed rate)	0...100 %	A.	0 %	000, 038
• Maximum control limit ( $U_{max}$ )	5...100 %	P.	100 %	038
• Vibrating frequency	15...30 Hz	F.	23Hz	038, 040
• External set-point 0...10 V, DC / 0(4)...20mA	0 / I	E.S.P.	0	038
• Second set-point (coarse / fine)	0...100 %	2.	0.0	038
• Select regulation mode	0 / I	ACC.	I	038
• P characteristic	0...100	P.A.	100	038
• I characteristic	0...100	I.A.	100	038
• Automatic frequency control	0 / I	A.F.C.	1	038
• Start automatic frequency search		A.F.S.		038
• Interface Off / On	0 / I	S.I.F.	0	040
• Display actual current	n/a	i	n/a	038, 040
• Current limit	0 – 100 %	I	60 %	040
• Low frequency limit	5 – 150 Hz	FL	15 Hz	040
• High frequency limit	5 – 150 Hz	FH	30 Hz	040
• Master - slavemode	0 / I	Chr.	0	028
• Hide menus	0 / I	Hd.C.	0	117
• Save user settings		PUSH		143
• Recall factory settings		FAC.		210
• Recall user settings		US.PA.		210
• Display software version number				001



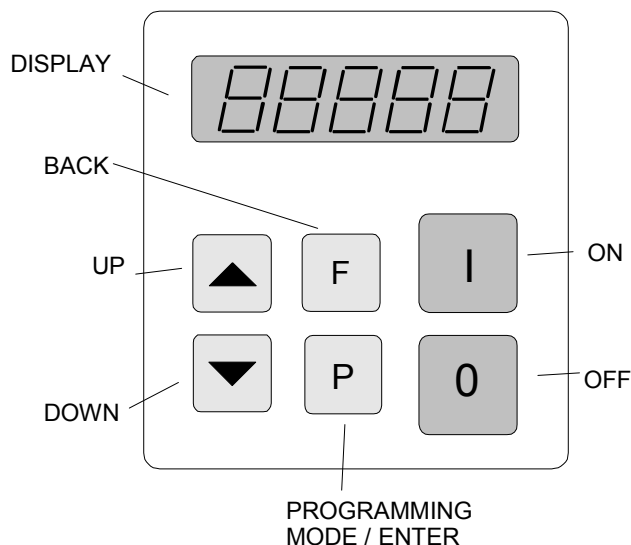
## 4.2 Settings

The six buttons and a LED display found in the front panel, are used for operating and setting up the unit. All operating methods and adjustable parameters can be set up through this panel.

The “I” and “O” buttons are used for switching the unit ON and OFF, however, **these do not provide mains isolation**, they simply inhibit the power semiconductors

The “P”, “F” and “Cursor Buttons” are used for parameter adjustment. Parameters are set by using menu controls which are called up by entering operator codes. A capital letter is used to indicate the selected function.

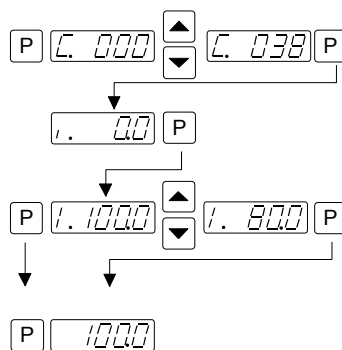
The display value can be increased or decreased by units, or tenths of units, by a short press of the cursor buttons. Holding the buttons down will cause the display to change in units of ten.



To prevent accidental or unauthorized adjustment the adjustment parameters, in the user menus, are protected. A code must be entered to open the user menus. There are different pass codes for each function group.

**Setting adjustments are automatically saved upon leaving the programming mode or if no button is pressed for a period of 100 seconds.**

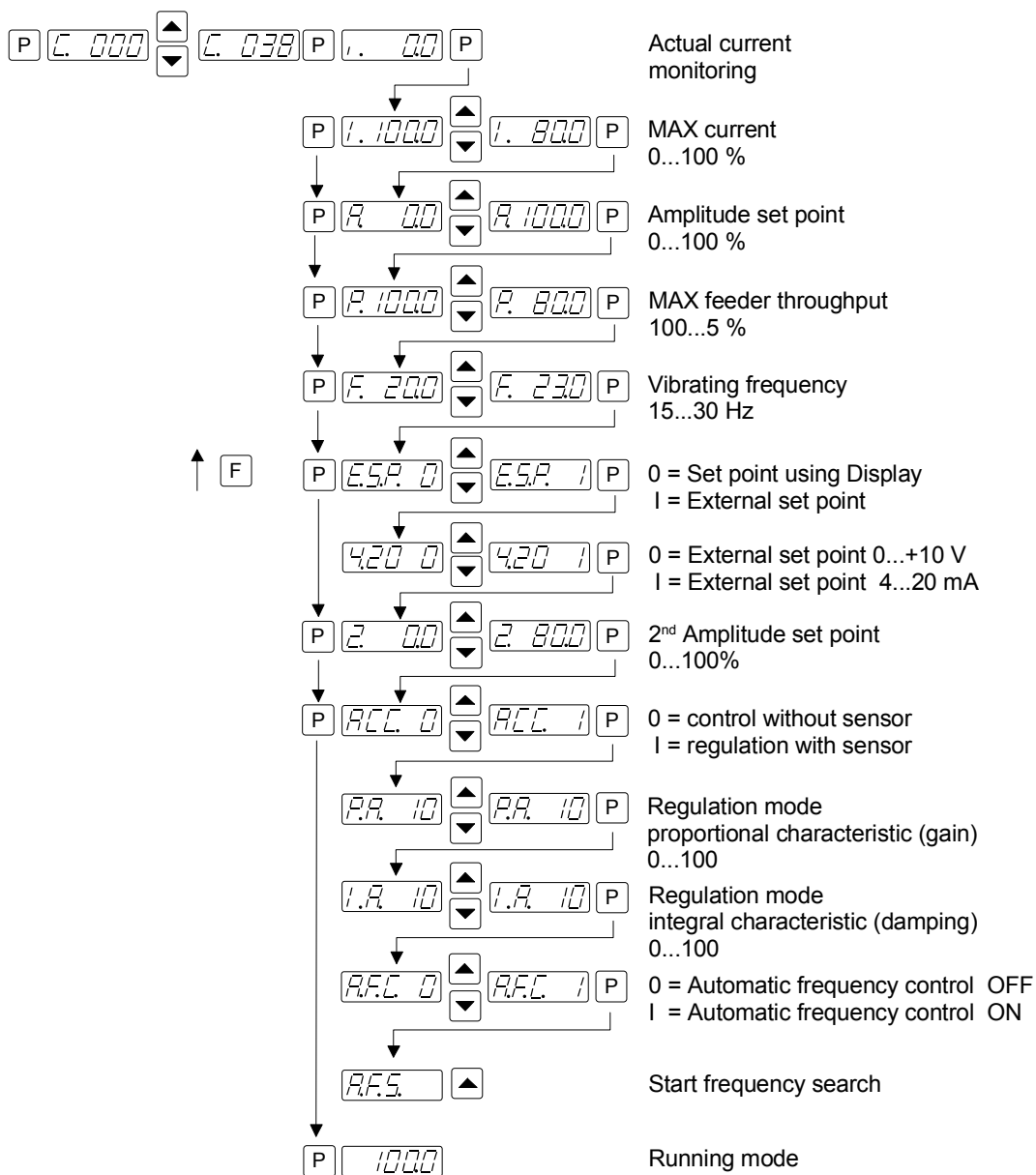
All setting routines are commenced by pressing the programming button “P”. The following diagram should clarify the sequence in which keys are pressed:-



1. Press the “P” key.
2. Select the code number with the cursor keys.
3. Press the “P” key. This displays the first menu point. The required menu point can be found by repeatedly pressing the “P” key (scrolling).
4. The value in the menu point can be changed with the cursor keys.
5. Scroll to the next menu point or to the end of the menu, which returns the display to the set point value, by pressing the “P” key. To exit the menu and return back to the normal display, quickly, depress the “P” key for 5 seconds.
6. To return back to the previous position in the menu, press the “F” key.

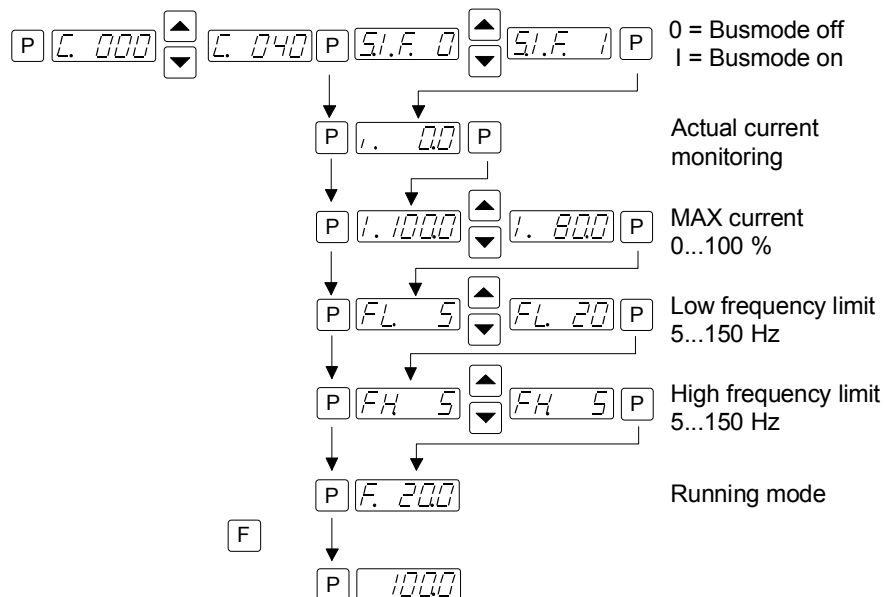
### 4.3 Standard menu

Code C 038 Feeder settings



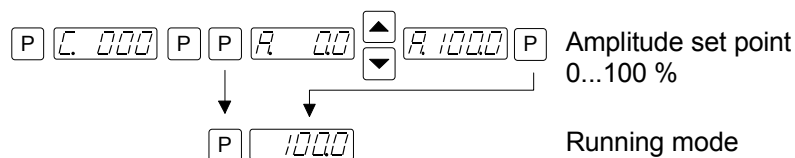
### 4.3.1 Limits

Code C 040 Limit settings



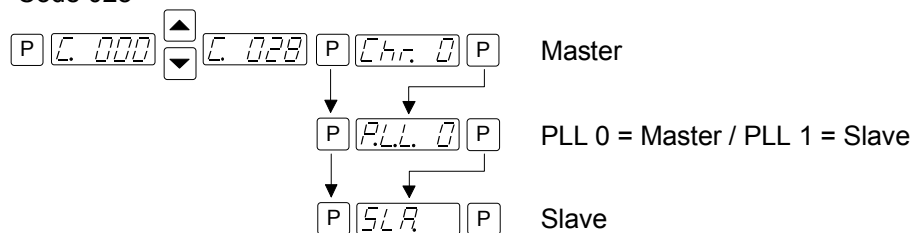
### 4.4 Set point (or push the P button twice without using the user code)

Code 000 Set point



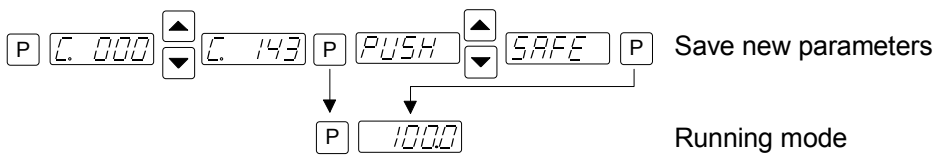
### 4.5 Master - Slave Mode

Code 028



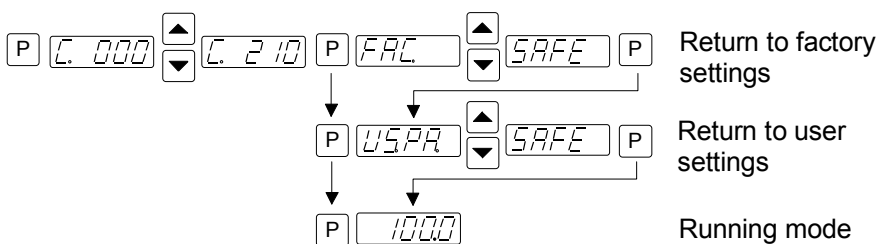
#### 4.6 Save user settings

Code 143



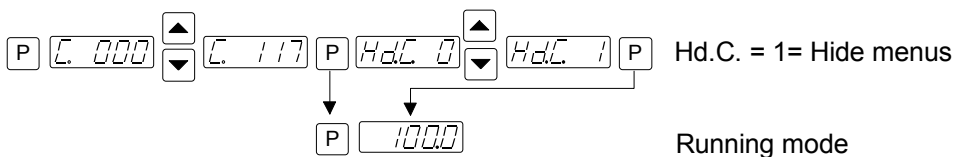
#### 4.7 Recall saved settings

Code 210



#### 4.8 Hide / display menus

Code 117



#### 5.0 Instructions for using regulation mode

- An accelerometer must be fitted to the vibratory feeder in order to run in regulation mode.
- **All** vibration signals that are picked up by the accelerometer are used by the regulator circuit. Stray signals generated by neighbouring machinery, a flimsy accelerometer mounting, or an unstable support frame, can cause incorrect regulation to occur. It is especially important to ensure that there are no external influences, of this type, during the automatic frequency search routine.
- **Resonant frequencies:** It is possible to have several vibrating frequencies, where resonance occurs, depending on the springing and masses of the system. The additional resonant points are at multiples of the dominant resonant frequency. Under extreme circumstances the automatic frequency search may be unable to differentiate between these frequencies and so in these instances the frequency must be set manually.

### 5.1 Instructions for setting up the controller in regulation mode

Connect control unit  
Install sensor and connect to controller

### 5.2 Determining the resonant frequency

#### Manual setting of the vibrating frequency

It is essential that the output frequency is adjusted with the set point set at a low frequency, otherwise on hitting the resonant frequency it is possible to achieve a high amplitude with a low output voltage. An analog, effective value, current indicating unit (moving iron meter) must be connected into the output circuit. **Resonant frequency is reached when there is a maximum amplitude for a minimum output current.**

#### Automatic frequency search

- The feeder should be empty for a frequency search
- Adjust the set point to zero
- Select regulation mode (Menu C 038, Parameter ACC = I )
- The optimum frequency of the feeder is found, automatically, by initiating the frequency search (Menu C 038, Parameter A.F.S.). When this has been found the controller resets the set point back to its original value (0).

### 5.3 Optimising the controller in regulation mode

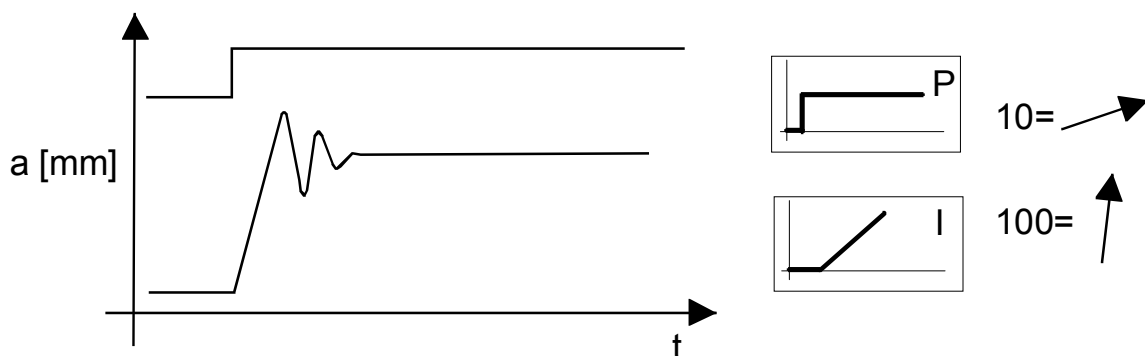
#### Setting the control range

1. In Menu C. 038 set parameter P (Max Limit) to 50 %
2. Set A (Feeder throughput) to 100%
3. Increase limit P from 50% until the required maximum feeder throughput is achieved

The full set point adjustment range of 0...100% can now be used

#### Optimising regulation: To stop unwanted feeder oscillation (hunting) or inadequate feedback regulation for load changes

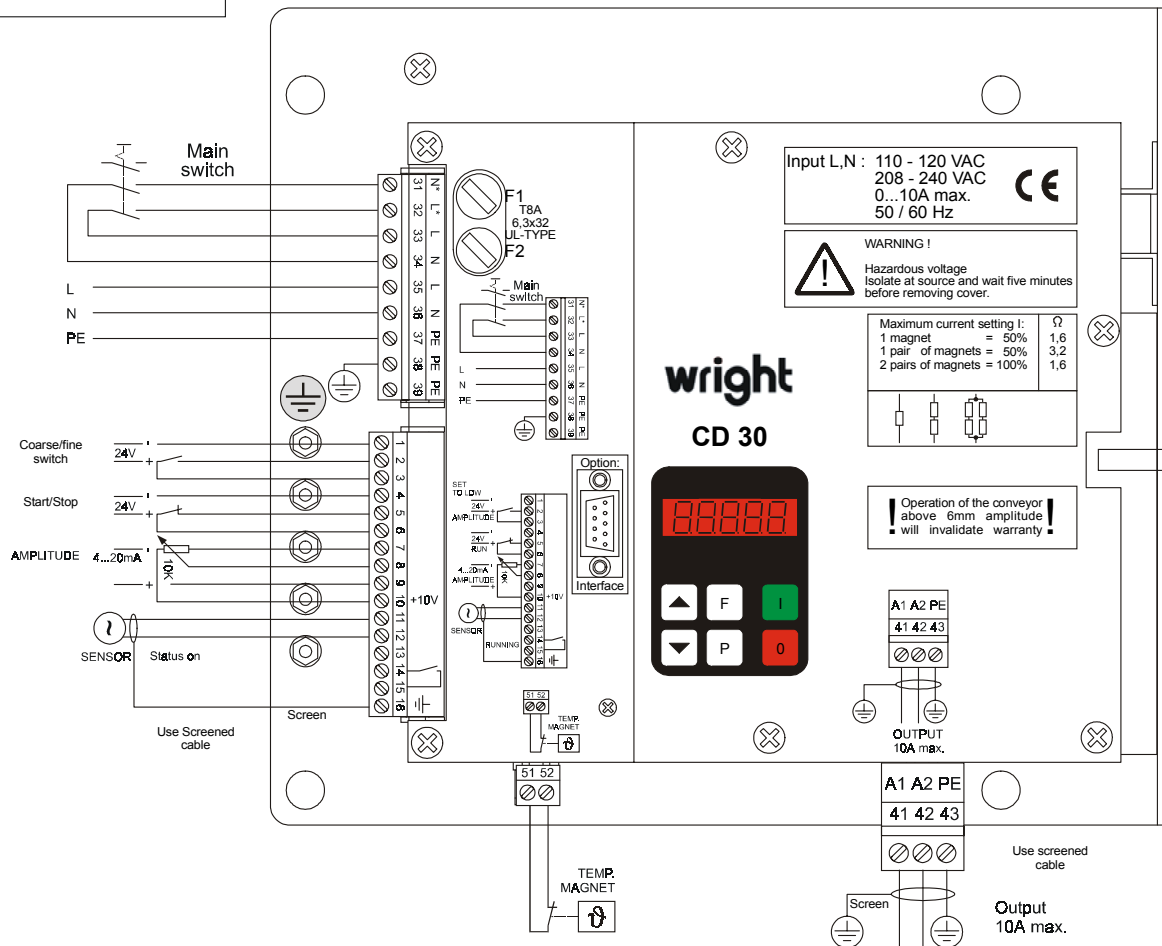
The response of the regulation circuit can be adjusted in menu C038 using the parameter PA (Proportional characteristic or circuit gain) and IA (Integral characteristic). In simplistic terms, P adjusts the sensitivity and I adjusts the speed of response.



In menu C038 reduce PA until feed oscillations cease  
Parameter IA should be set as close to 100 as possible

## 6.0 Connections

**use screened cable!**



**7.0 Dimensions**