Operating Instructions

SP01262

Frequency Inverter for Electromagnetic Vibratory Feeders

Hardware	SP01262
Hardware Version	H100
Software	FW00122
Software Version	V01.33 or later
Document Version	2026-07-22

Contents

1 General Information

1.1 Scope of Applicability

This document applies to the hardware and software versions specified on the title page.

1.2 Target group and required qualifications

Qualified personnel for electrical work

All electrical work may only be carried out by a qualified electrician with suitable training. For the purposes of this documentation, qualified electricians are persons who are familiar with the electrical installation, commissioning, troubleshooting and maintenance of the product and who are qualified in the field of electrical engineering in accordance with the applicable national regulations and are familiar with this documentation.

Qualified personnel for mechanical work

All mechanical work may only be carried out by a specialist with suitable training. For the purposes of this documentation, specialists are persons who are familiar with the design, mechanical installation, troubleshooting and maintenance of the product and who are qualified in the field of mechanics in accordance with the applicable national regulations and are familiar with this documentation.

Additional qualifications

The persons must also be familiar with the applicable safety regulations, laws and the other standards, directives and laws mentioned in this documentation.

Instructed personnel

All work in the other areas of transportation, storage, installation, operation and disposal may only be carried out by instructed personnel. These instructions must enable the persons to carry out the required activities and work steps safely and as intended.

1.3 Concept of the Safety Instructions

The following types of safety instructions are used in this manual:

DANGER!	
	The signal word **DANGER** indicates a hazard with a high degree of risk. If the hazard is not avoided, death or serious (irreversible) injury will result.

WARNING!	
	The signal word **WARNING** indicates a hazard with a medium level of risk. If the hazard is not avoided, death or serious (irreversible) injury may result.

CAUTION!	
	The signal word **CAUTION** indicates a hazard with a low level of risk. If the hazard is not avoided, a minor or moderate injury may result.

ATTENTION!
The signal word **CAUTION** indicates an important warning which, if ignored, may result in damage to equipment.

1.4 Meaning of the Hazard Symbols

Hazard Symbol	Meaning
	General sources of hazards
	Warning of hazardous electrical voltage
	Warning of hot surface
	Warning about automatic start-up

2 Safety

2.1 Intended Use

The device is primarily intended for the control of electromagnetic vibratory feeder drives. The device can also be used to control various peripheral components of a vibratory conveyor system.

2.2 Non-intended Use

Any use other than that described under “Intended Use” and the following chapters of this document is non-intended use and is therefore not permitted. The manufacturer accepts no liability for damage caused by non-intended use.

Examples of non-intended use of the device are:

- Opening the device
- Impermissible changes to the device
- Cutting off or modifying permanently attached cables, if present
- Driving non-inductive loads with the inverter output (e.g. piezo drives)
- Parallel connection of the outputs of multiple inverters
- Operation on vibrating surfaces
- Operation in potentially explosion-hazardous areas
- Operation in the vicinity of highly flammable substances
- Operation under conditions that do not comply with the specifications in this document

2.3 General Safety Instructions

This chapter lists safety instructions that must generally be observed. Read all safety instructions carefully before using the device!

DANGER!	
	**Risk of death due to electrical voltage!** Live parts can cause serious injuries. ➔ Disconnect the appliance from the power supply before carrying out any work on the wiring!

DANGER!	
	**Risk of death due to stored charge!** The DC link capacitors remain live for a limited time after disconnection from the mains. ➔ Wait 5 minutes after disconnecting from the mains before carrying out any work on the wiring!

DANGER!

Risk of death due to unauthorized modifications to the device!

Unauthorized modifications to the appliance can lead to serious safety issues.

ATTENTION!

Warranty void due to unauthorized modifications to the device!

The warranty is void if unauthorized modifications are made to the device.

CAUTION!

Risk of burns from hot surfaces!

The housing can become hot in the area of the rear panel during operation.

ATTENTION!

Damage to the device due to impermissible ambient conditions!

Failure to comply with the permissible ambient conditions may result in damage to the device.

➔ Always observe the permissible ambient conditions: Temperature, humidity, air supply, cooling and mounting position!

WARNING!

Unexpected behavior when modifying parameters while enable signal is active!

Modifications to the parameters can lead to unexpected behavior if the enable signal is active at the same time.

➔ Only modify parameters when the enable signal is not active!

3 Product Description

3.1 Features

- Output frequency is independent of mains frequency, no mechanical tuning of the vibration frequency required
- Fast, automatic resonance search (1)(2)
- Automatic control of the oscillation amplitude for a constant feed rate (1)(2)
- Automatic frequency control so that the conveyor always operates at the resonance point with maximum efficiency (1)(2)
- Current limiting for magnet protection
- Short-circuit and earth fault protection
- Various output waveforms
- Wide input voltage range for worldwide use (3)
- Integrated user interface and mains switch (4)
- Flexible control inputs and outputs
- Additional logic gates
- Level control (1)
- Sorting air control (1)
- Pulse mode (1)
- Control logic for refill feeder (1)
- Control logic for pneumatic step conveyor as refill feeder (1)
- Control logic for signal lights
- Setpoint switching (coarse/fine control)
- Synchronization of multiple devices
- Safe disable (SVO, based on STO according to EN IEC 61800-5-2) (1)
- Field bus interface (1)
- USB-C interface for PC
- Protection class IP20 or IP54

(1) Optional

(2) Requires acceleration sensor

(3) With suitable dimensioning of the electromagnet

(4) Only on IP54 version without fieldbus

3.2 Type Designation

SP01262 – ❶ ❷ ❸ – 0 ❹ ❺ ❻ ❼

❶	Logo on Front Panel	Nameplate
00	MOSCA Elektronik und Antriebstechnik GmbH	MOSCA Elektronik und Antriebstechnik GmbH

❷	IP Code	Status LEDs	IN1…8	OUT1..4	OUT5	Fieldbus Module	SVO
01	IP20	●	●	●	●		
02	IP20	●	●	●	●	Ethernet	
03	IP20	●	●	●	●		●
04	IP20	●	●	●	●	Ethernet	●
05	IP20	●	●	●	●	RS485	

❷	IP Code	Status LEDs	Display, Buttons	Mains Switch	IN1, OUT1 IN5	IN2, OUT2 IN6	IN3, OUT3 IN7	IN4, OUT4 IN8	OUT5 (Relay)	Fieldbus Module	SVO
10	IP54		●	●	●	●	●	●	●		
11	IP54		●	●	●	●	●	●			
12	IP54		●	●	●	●			●		
13	IP54		●	●	●	●					
14	IP54	●			●					Ethernet	
15	IP54		●	●	●	●	●	●			●
16	IP54	●								Ethernet	●

Preferred variants are marked in green

❸	Conformity	Certifications
blank	CE	
UL	CE	c UL us LISTED (Expected to be available in mid-2027)

❹	Fieldbus
0	No fieldbus
1	Fieldbus: EtherNet/IP (only devices with ethernet fieldbus module)
2	Fieldbus: PROFINET (only devices with ethernet fieldbus module)
3	Fieldbus: MODBUS RTU (only devices with RS485 fieldbus module)

❺	Amplitude/Frequency Control and Resonance Search	Synchronization
0		
1	●	
2		●
3	●	●

❻	Level Control	Refill Feeder	Pneumatic Step Conveyor
0			
1	●		
2		●	
3	●	●	
4			●
5	●		●
6		●	●
7	●	●	●

❼	Sorting Air Control	Pulse Mode
0		
1	●	
2		●
3	●	●

Example:
SP01262-0010-00373
Fully equipped standard version, IP54, without fieldbus, without SVO, without UL

3.3 Scope of Delivery

Quantity	Component
1	SP01262
1	Mating connector set (IP20 variants only)

Mating connectors are not included in the scope of delivery of IP54 variants and can be ordered separately.

3.4 Technical Data

All AC voltages and currents are given as RMS values unless otherwise stated.

General	
Installation orientation	vertical
Weight	IP20: 1.1kg IP54: 1.4kg
Installation altitude	≤ 2000m
Heat sink temperature	≤ 85°C
Ambient temperature	0…45°C
Storage temperature	–25…+75°C
Relative humidity	≤ 95%, not condensing
IP code	IP20 or IP54 See chapter 3.9
Appliance class	I
Overvoltage category	III
Pollution degree	2
Standards and directives	EN IEC 61800-5-1 EN IEC 61800-3 EN IEC 61000-6-2 EN IEC 61000-6-4

Mains Input	
Mains voltage	100…240V ± 10%
Mains frequency	50/60Hz ± 5%
Permissible input current	≤ 5A See chapter 3.10
Input current (at V_{mains} = 230V, S_{mag} = 2kVA, $\tan\delta_{mag}$ = 0,1)	< 2A
Inrush current (peak) (at ϑ_{device} = 25°C, last switch-on before ≥ 5 minutes)	≤ 6A
External fuse	≤ 16A
Earth leakage current	< 3.5mA

Magnet Output	
Output voltage (waveform = sine)	0…0.95 × V_{mains}
Output current	≤ 10A See chapter 3.5
Output current limitation	0.1…10A
Output current limitation (peak)	16A
Output frequency (electrical)	5…1000Hz
Frequency resolution	≤ 0.01Hz

Internal Control Supply (+24V)	
Output voltage	24V
Output current	200mA

Ground Reference (GND)	
Potential difference GND – PE	≤ 28V
Internal impedance GND – PE	10kΩ

Control Inputs (IN1…8)	
Type	Digital or analog (configurable via software)
Input voltage	−3…+30V
Measurement range	0…30V
Input characteristic (digital)	EN 61131-2 Type 1+3
Input impedance (voltage input, analog)	> 100kΩ
Input impedance (current input, analog, only IN5…8)	300Ω

Control Outputs (OUT1…4)	
Type	Semiconductor switch, switching to +24V
Output voltage (OFF) (at R_L = 10kΩ)	0…0.05V
Output voltage (ON) (at I_L = 500mA)	Supply – 0.6V
Output current per channel	≤ 500mA
Supply source	Internal or external
External supply voltage	24V ± 15%
External supply fusing	≤ 4A

NOTE: The inputs IN1 to IN4 are internally connected to the outputs OUT1 to OUT4. A maximum of 8 inputs and outputs are therefore available in total (plus OUT5).

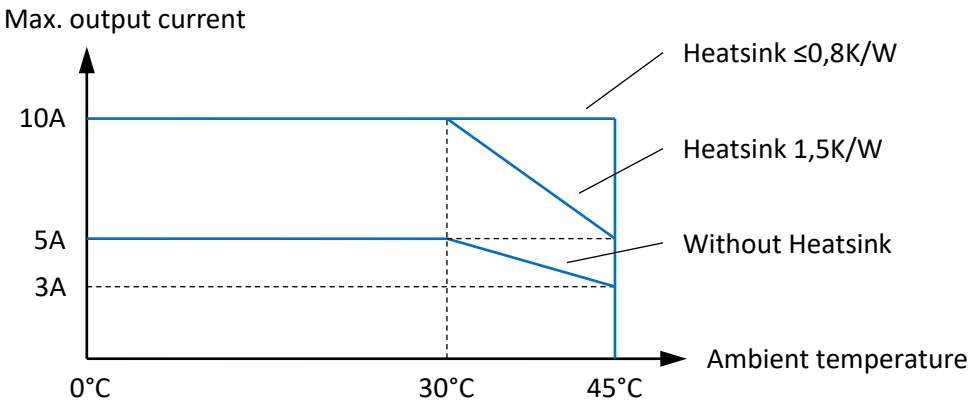
Relay Output (OUT5)	
Type	SPDT
Switching voltage	≤ 35V
Switching current (resistive and inductive)	≤ 1A

SVO Input	
Channels	2
Input voltage	24V ± 25%
Input current	< 5mA
OSSD test pulse duration	≤ 5ms
OSSD test pulse interval	≥ 200ms

Fieldbus Module	
Supply voltage	24V ± 15%
Input current	< 40mA
Feed-through current	≤ 2A

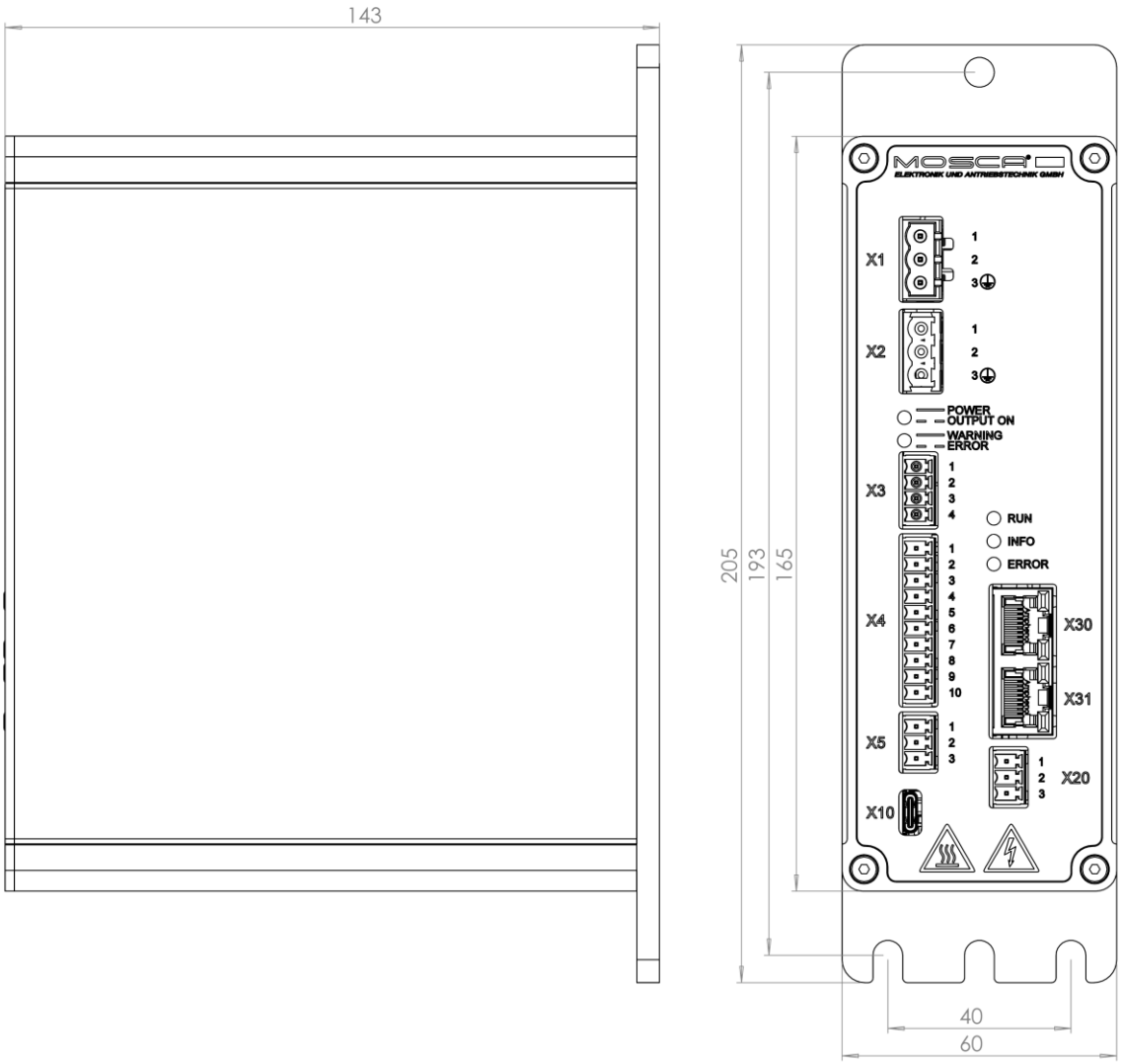
3.5 Derating

The maximum output current is reduced depending on the ambient temperature and cooling.

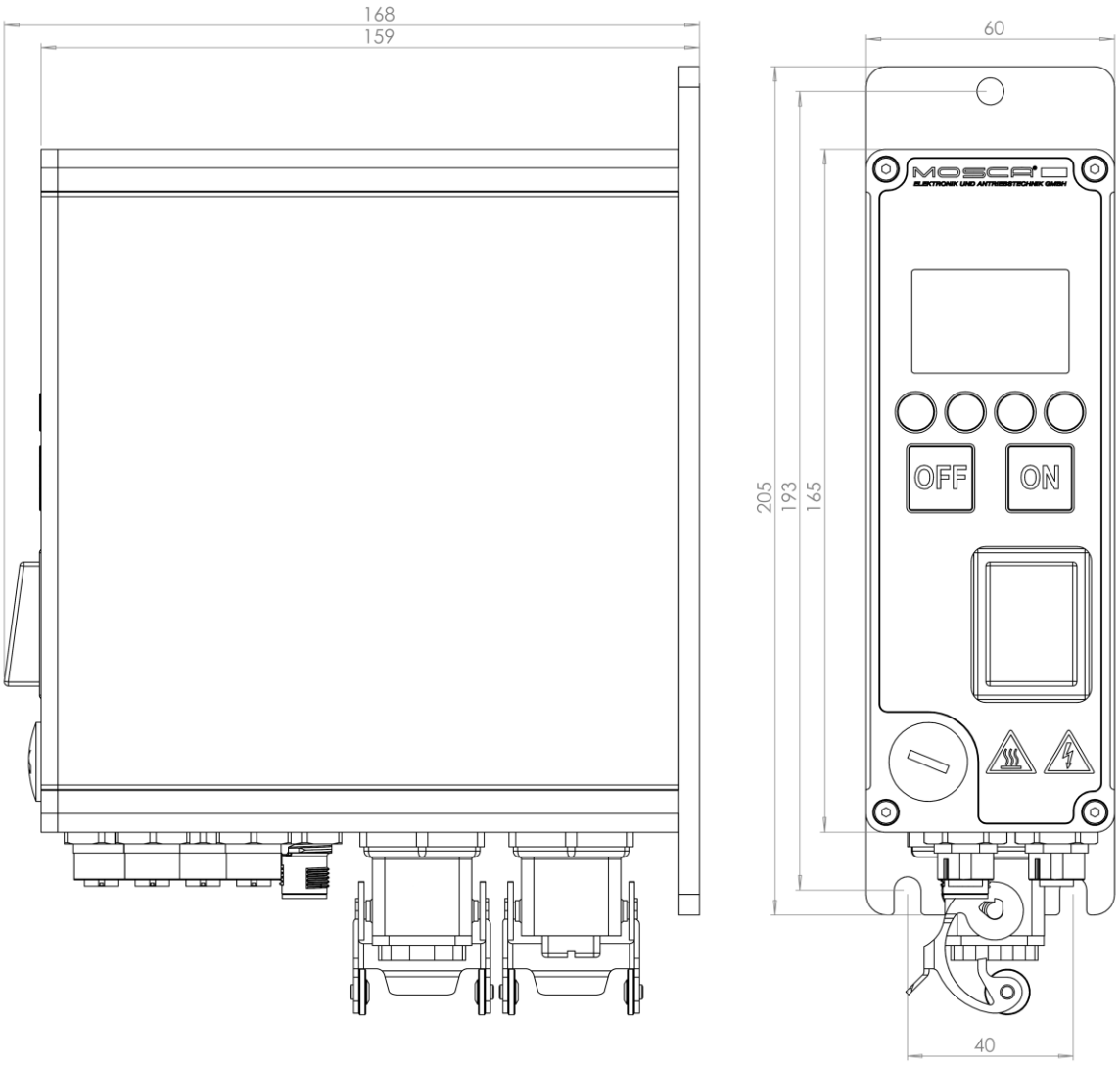


3.6 Dimensions

IP20



IP54



3.7 Installation

The following points must be observed during installation:

- The device must be mounted on a suitable, flat surface.
- The device must be mounted vertically.
- Several screw mounting points (suitable for M5 and M6) are provided on the rear panel for mounting. The device must always be mounted at the top and bottom. In the lower row, either the middle mounting point or both outer mounting points must be used.
- The device must be mounted so that the screw mounting points and connectors are easily accessible.
- Sufficient heat dissipation must be ensured, especially if several devices are mounted next to each other. The device is cooled via the rear panel. The temperature of the rear panel (see P1010) should not exceed 65°C during continuous operation.

To ensure adequate heat dissipation, the minimum distances to adjacent components specified in the following table must be observed. The distances refer to the outer contour of the rear panel.

Application	Minimum distance left/right	Minimum distance top/bottom
Output current 0…2A No additional heatsink	10mm	10mm
Output current 2…5A No additional heatsink	60mm	60mm
Output current 2…5A Passive additional heatsink, <1,5K/W	10mm	60mm
Output current 5…10A Passive additional heatsink, <1,5K/W	60mm	100mm
Output current 5…10A Additional heatsink with fan, <0,5K/W (e.g. Fischer Elektronik LA 6)	10mm	100mm

If adequate heat dissipation can be achieved by other means, deviations from the above distances are permitted, provided that the minimum distance of 10 mm is not exceeded.

If the passive additional heat sink (optional accessory) is to be used, it must be screwed onto a suitable flat surface together with the device. The flat side of the heat sink must face the rear panel of the device. There must be no foreign matter between the rear wall and the heat sink.

3.8 Installation Altitude

DANGER!	
	**Risk of death due to impermissible installation altitude!** Above an installation altitude of 2000m, safe separation of the power and control sections is no longer guaranteed. ➔ The device must not be used above 2000m!

3.9 IP Code for IP54 Devices

To comply with IP54, all enclosure openings must be covered and all unused connectors must be sealed with suitable protective caps. The protective caps are available as accessories.

- If the cover of the USB port X10 is open, the ingress protection rating is reduced to IP10.
- Missing protective caps on all other connectors reduce the ingress protection rating to IP20.

3.10 Input Current

Exceeding the maximum permissible input current can cause the device to fail. Compliance must therefore be verified during commissioning. A true RMS meter must be used for this purpose, as the input current is not sinusoidal.

If the system is to be operated with different mains voltages, note that the input current is inversely proportional to the mains voltage. For example, the input current doubles when the mains voltage is halved.

3.11 Power-On Frequency

Switching the device on and off too frequently can reduce its service life or cause it to fail. Regular starting and stopping of the feeder must always be performed using the OFF/ON buttons or an enable input.

If it is necessary to integrate the device into a machine's safety circuit, the optional SVO input should be used for this purpose.

3.12 Earth Leakage Current

The leakage current is not greater than 3.5mA in accordance with EN 61800-5-1. The touch current measurement method according to IEC 60990 Fig. 4 was used to determine this.

High-frequency components of the current can exceed 3.5mA; operation with a residual current device (RCD) must therefore be checked in each individual case.

3.13 Residual Current Devices (RCD)

Unless the use of a residual current device is required by standard, we recommend not using a residual current device.

If the use of a residual current device is required, type F or B should be used, which are suitable for residual currents with mixed frequencies.

3.14 Electromagnetic Compatibility (EMC)

Interference Immunity

The device meets the interference immunity requirements of EN IEC 61800-3 and EN IEC 61000-6-2.

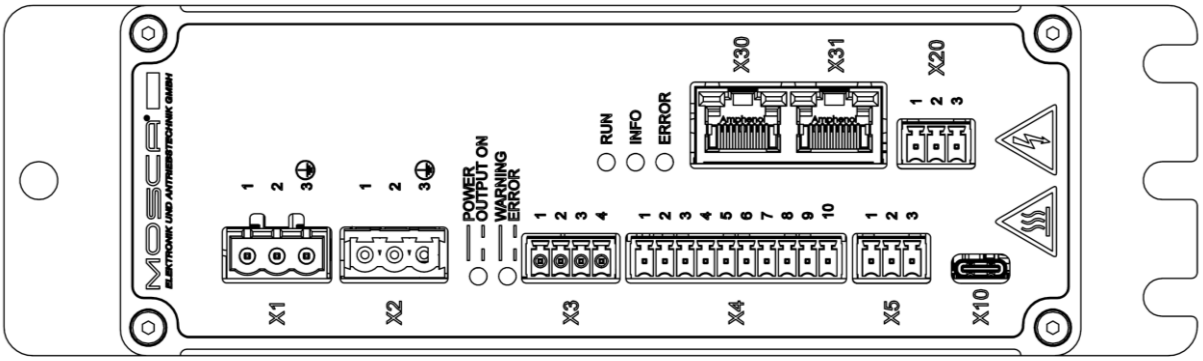
Interference Emission

The device has internal input and output filters. Compliance with the interference emission limits according to EN IEC 61800-3 (C3) and EN IEC 61000-6-4 was verified with a typical setup. Since the device is only a component for a machine or system, compliance with the limits must be considered independently in each individual case. Additional measures may need to be taken, such as shielding and additional filters.

ATTENTION!
This device is not intended for use in a public low-voltage grid that supplies residential areas!

4 Connectors

4.1 IP20



X1 Mains Input		
Pin	**Designation**	**Function**
1	L	Mains input phase
2	N	Mains input neutral
3	PE	Mains input protective earth
Mating connector: Phoenix Contact FKC 2,5/ 3-ST-5,08		

X2 Magnet Output		
Pin	**Designation**	**Function**
1	M1	Magnet output terminal 1
2	M2	Magnet output terminal 2
3	PE	Magnet output protective earth
Mating connector: Phoenix Contact FKIC 2,5/ 3-ST-5,08		

X3 SVO Input		
Pin	**Designation**	**Function**
1	SVO1-IN	SVO input channel 1 +
2	SVO1-GND	SVO input channel 1 −
3	SVO2-GND	SVO input channel 2 −
4	SVO2-IN	SVO input channel 2 +
Mating connector: Phoenix Contact FMC 1,5/ 4-ST-3,5		

Please note: The SVO input is a redundant hardware function. If this option is installed, it can not be deactivated via software.

X4 Control Inputs and Outputs		
Pin	**Designation**	**Function**
1	+24V	24V input and output
2	GND	GND for +24V, IN1…8 and OUT1…4
3	OUT1/IN1	Control output 1 or control input 1
4	OUT2/IN2	Control output 2 or control input 2
5	OUT3/IN3	Control output 3 or control input 3
6	OUT4/IN4	Control output 4 or control input 4
7	IN5	Control input 5
8	IN6	Control input 6
9	IN7	Control input 7
10	IN8	Control input 8
Mating connector: Phoenix Contact FMC 1,5/10-ST-3,5		

X5 Relay Output		
Pin	**Designation**	**Function**
1	OUT5-COM	Relay common
2	OUT5-NC	Relay normally closed contact
3	OUT5-NO	Relay normally open contact
Mating connector: Phoenix Contact FMC 1,5/ 3-ST-3,5		

X10 USB
Mating connector: USB-C

X20 Fieldbus Supply Input (all Fieldbus Modules)		
Pin	**Designation**	**Function**
1	+24V-IN-FB	24V input for fieldbus module
2	GND-FB	GND input for fieldbus module
3	FE	Functional earth
Mating connector: Phoenix Contact FMC 1,5/ 3-ST-3,5		

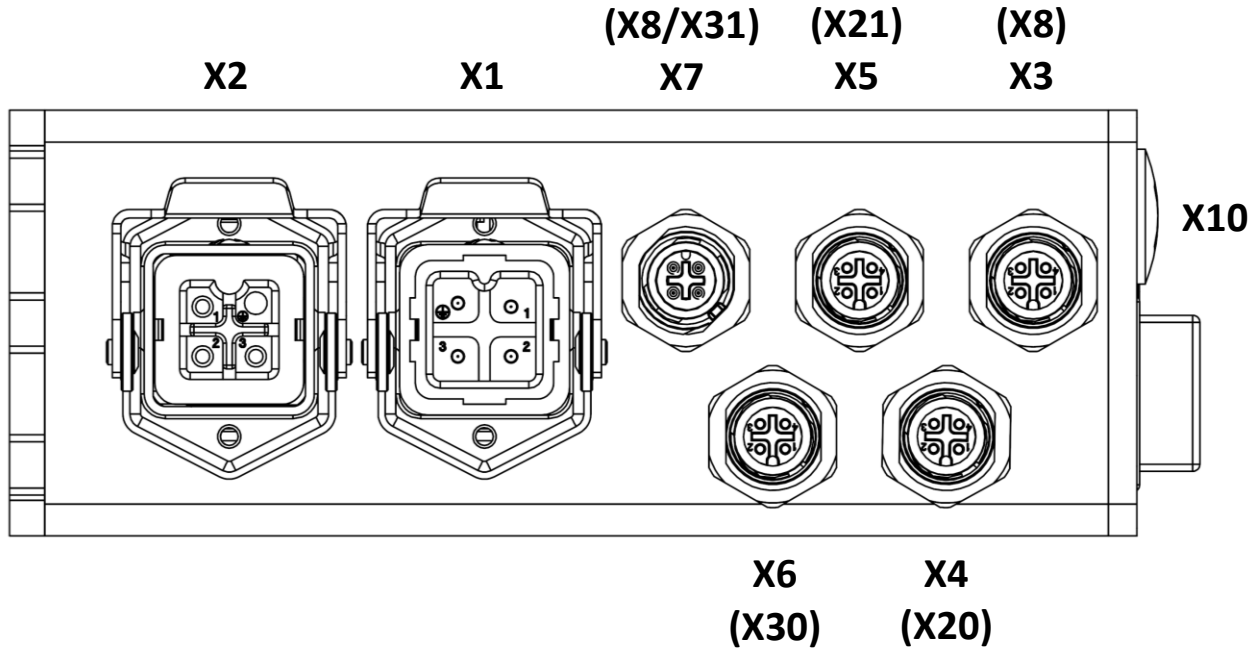
X30 Fieldbus Data (Ethernet Fieldbus Modules only)		
Pin	**Designation**	**Function**
1	TX0+	TX0+
2	TX0–	TX0–
3	RX0+	RX0+
4	—	75Ω termination
5		
6	RX0–	RX0–
7	—	75Ω termination
8		
Mating connector: RJ45		

X31 Fieldbus Data (Ethernet Fieldbus Modules only)		
Pin	**Designation**	**Function**
1	TX1+	TX1+
2	TX1−	TX1−
3	RX1+	RX1+
4	—	75Ω termination
5		
6	RX1−	RX1−
7	—	75Ω termination
8		
Mating connector: RJ45		

X30…X31 Fieldbus Data and Power (RS485 Fieldbus Modules only)		
Pin	**Designation**	**Function**
1	—	
2	—	
3	—	
4	RS485-A	D1 for MODBUS
5	RS485-B	D0 for MODBUS
6	—	
7	+24V-FB	24V input/output for fieldbus module (connected to X20)
8	GND-FB	GND input/output for fieldbus module (connected to X20) and ground reference for RS485
Mating connector: RJ45		

4.2 IP54

The X designators in brackets refer to the special versions with SVO and fieldbus.



X1 Mains Input		
Pin	**Designation**	**Function**
1	L	Mains input phase
2	N	Mains input neutral
3	—	—
PE	PE	Mains input protective earth
Mating connector: ILME CKSF03 or HARTING Han 3A female		

X2 Magnet Output		
Pin	**Designation**	**Function**
1	M1	Magnet output terminal 1
2	M2	Magnet output terminal 2
3	—	—
PE	PE	Magnet output protective earth
Mating connector: ILME CKSM03 or HARTING Han 3A male		

X3 Control Input and Output		
Pin	**Designation**	**Function**
1	+24V	24V input and output
2	IN5	Control input 5
3	GND	GND for +24V, IN1…8 and OUT1…4
4	OUT1/IN1	Control output 1 or control input 1
Mating connector: M12 4 pol. A coded male, e.g. Phoenix Contact SACC-MS-4QO-0,34-M SCO		

X4 Control Input and Output		
Pin	**Designation**	**Function**
1	+24V	24V input and output
2	IN6	Control input 6
3	GND	GND for +24V, IN1…8 and OUT1…4
4	OUT2/IN2	Control output 2 or control input 2
Mating connector: M12 4 pol. A coded male, e.g. Phoenix Contact SACC-MS-4QO-0,34-M SCO		

X5 Control Input and Output		
Pin	**Designation**	**Function**
1	+24V	24V input and output
2	IN7	Control input 7
3	GND	GND for +24V, IN1…8 and OUT1…4
4	OUT3/IN3	Control output 3 or control input 3
Mating connector: M12 4 pol. A coded male, e.g. Phoenix Contact SACC-MS-4QO-0,34-M SCO		

X6 Control Input and Output		
Pin	**Designation**	**Function**
1	+24V	24V input and output
2	IN8	Control input 8
3	GND	GND for +24V, IN1…8 and OUT1…4
4	OUT4/IN4	Control output 4 or control input 4
Mating connector: M12 4 pol. A coded male, e.g. Phoenix Contact SACC-MS-4QO-0,34-M SCO		

X7 Relay Output		
Pin	**Designation**	**Function**
1	OUT5-COM	Relay common
2	OUT5-NC	Relay normally closed contact
3	—	—
4	OUT5-NO	Relay normally open contact
Mating connector: M12 4 pol. A coded female, e.g. Phoenix Contact SACC-FS-4QO-0,34-M SCO		

X8 SVO Input		
Pin	**Designation**	**Function**
1	SVO1-IN	SVO input channel 1 +
2	SVO1-GND	SVO input channel 1 −
3	SVO2-GND	SVO input channel 2 −
4	SVO2-IN	SVO input channel 2 +
Mating connector: M12 4 pol. A coded female, e.g. Phoenix Contact SACC-FS-4QO-0,34-M SCO		

Please note: The SVO input is a redundant hardware function. If this option is installed, it can not be deactivated via software.

X10 USB
Mating connector: USB-C

X20 Fieldbus Supply Input (Ethernet Fieldbus Modules only)		
Pin	**Designation**	**Function**
1	+24V-IN-FB	24V input for fieldbus module
2	—	—
3	GND-FB	GND input for fieldbus module
4	—	—
5	FE	Functional earth
Mating connector: M12 5 pol. A coded female, e.g. Phoenix Contact SACC-M12FS-5PL M		

X21 Fieldbus Supply Output (Ethernet Fieldbus Modules only)		
Pin	**Designation**	**Function**
1	+24V-OUT-FB	24V output from fieldbus module
2	—	—
3	GND-FB	GND output from fieldbus module
4	—	—
5	FE	Functional earth
Mating connector: M12 5 pol. A coded male, e.g. Phoenix Contact SACC-M12MS-5PL M		

X30 Fieldbus Data (Ethernet Fieldbus Modules only)		
Pin	**Designation**	**Function**
1	TX0+	TX0+
2	RX0+	RX0+
3	TX0−	TX0−
4	RX0−	RX0−
Mating connector: M12 4 pol. D coded male, e.g. Phoenix Contact SACC-M12MSD-4Q SH		

X31 Fieldbus Data (Ethernet Fieldbus Modules only)		
Pin	**Designation**	**Function**
1	TX1+	TX1+
2	RX1+	RX1+
3	TX1−	TX1−
4	RX1−	RX1−
Mating connector: M12 4 pol. D coded male, e.g. Phoenix Contact SACC-M12MSD-4Q SH		

X30 Fieldbus Data and Power Input (RS485 Fieldbus Modules only)		
Pin	**Designation**	**Function**
1	+24V-FB	24V input for fieldbus module
2	RS485-B	D0 for MODBUS
3	GND-FB	GND input for fieldbus module and ground reference for RS485
4	RS485-A	D1 for MODBUS
5	FE	Functional earth / shielding
Mating connector: M12 5 pol. B coded female, e.g. Phoenix Contact SACC-M12FSB-5PL SH		

X31 Fieldbus Data and Power Output (RS485 Fieldbus Modules only)		
Pin	**Designation**	**Function**
1	+24V-FB	24V output from fieldbus module
2	RS485-B	D0 for MODBUS
3	GND-FB	GND output for fieldbus module and ground reference for RS485
4	RS485-A	D1 for MODBUS
5	FE	Functional earth / shielding
Mating connector: M12 5 pol. B coded male, e.g. Phoenix Contact SACC-M12MSB-5PL SH		

5 User Interface

5.1 Parameters

All settings and measured values of the device are accessible via parameters.

Each of those parameters has a 4-digit hexadecimal address assigned to it as a unique identifier.

In the parameter window (MEDI), this address is displayed on the left of the parameter names, as well as on the top right of the display on each parameter page.

In this document the parameter addresses are preceded by the letter P to distinct them from other numbers while maintaining readability. For example, parameter 1234 is abbreviated to P1234.

Parameters of unavailable software options are hidden in MEDI and in the display.

5.2 PC Software MEDI

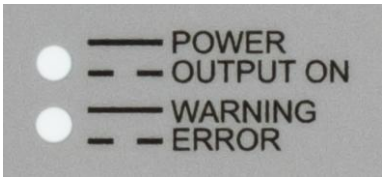
The settings and measurements of the device can be accessed via the PC software *MOSCA Elektronik Device Interface* (MEDI). It also enables the import and export of parameter sets.

The software can be downloaded free of charge from
https://www.mosca-elektronik.de/produkte/medi.html.

In some cases, Microsoft Windows might not install the drivers for the interface chip automatically. When this happens, please download the VCP driver as an executable setup from https://ftdichip.com/drivers/vcp-drivers/ and install it manually.

Operating System	Release Date	X86 (32-Bit)	X64 (64-Bit)	PPC	ARM	MIPSII	MIPSIV	SH4	Comments
Windows (Desktop)*	[illegible]	[illegible]	[illegible]	–	[illegible]	–	–	–	WHQL Certified. Includes VCP and D2XX. Available as a setup executable Please read the Release Notes and Installation Guides.

5.3 Status Indicators (IP20 only)



Green	Meaning
Off	Device is off
On	Device is ready, magnet output is not enabled
Flashing	Magnet output is enabled

Red	Meaning
Off	No warning or error
On	A warning message is active
Flashing	An error message is active

5.4 Status Indicators Fieldbus Module (IP20 only)

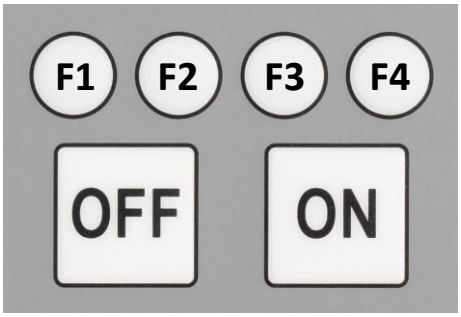
RUN (Green)	Meaning
Off	Fieldbus module is off
On	Fieldbus module ready

INFO (Yellow)	Meaning
Aus	No information
Blinkt	PROFINET: device identification

ERROR (Red)	Meaning
Aus	No error
Ein	No fieldbus connection PROFINET: device has been reset to factory settings

5.5 Integrated User Interface (IP54 only)

In addition to the USB interface, there is also an integrated user interface in the device that can be used to access most functions.



OFF/ON Buttons

The OFF/ON buttons are used to enable the magnet output. These buttons also act as a status display:

Indicator	Meaning
OFF is lit red	Device is ready, magnet output is not enabled
OFF flashes red	An error message is active
ON is lit green	Magnet output is enabled
ON flashes green	Resonance search is performed

Function Buttons

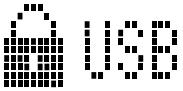
The functions of the buttons F1 to F4 are shown at the bottom of the display above:

Symbol	Function
	Main menu
	Quick access to the setpoint
	Quick access to the vibration frequency
	Quick access to the rated current
	Starts the resonance search
	Custom quick access defined via P3005 *F1 Custom*
	Custom quick access defined via P3006 *F2 Custom*
	Custom quick access defined via P3007 *F3 Custom*
	Custom quick access defined via P3008 *F4 Custom*
	The parameter address specified for the custom quick access was not found

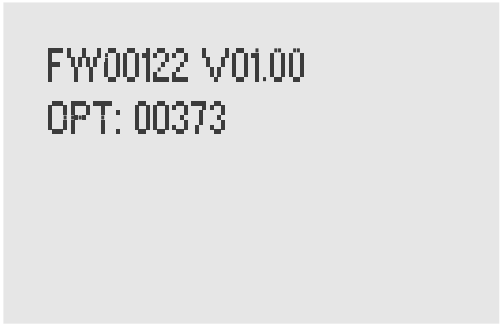
Symbol	Function
	Open selected menu item
	Back to previous page
	Next menu item
	Previous menu item
	Cancel
	Repeat / Reset

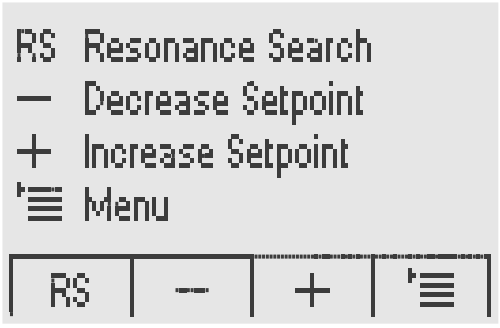
Symbol	Function
	Edit value
	Save value
	Increase value or select next value
	Decrease value or select previous value
	For button parameters: Press button

Info Symbols

Symbol	Meaning
	Information
	Editing of this parameter is disabled through P3010
	Editing of this parameter is disabled because MEDI is connected to the device

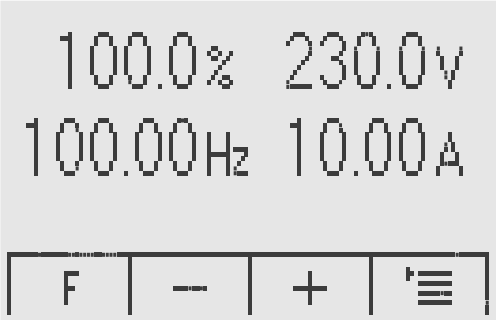
Start Page and Info Page





When switched on, the software name, version and options are displayed. An overview of the function buttons is then briefly displayed before switching to the main page.

Main Page



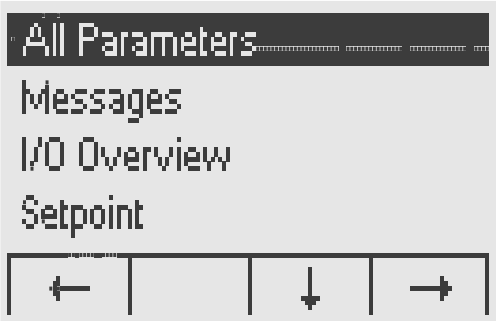
The setpoint (P7120), the vibration frequency (P7220), the output voltage (P7330) and the output current (P7332) are displayed on the main page. If the amplitude and frequency controller is activated, the acceleration setpoint (P8020) and the actual acceleration (P8021) are also displayed.

The functions of the function buttons are displayed in the lower area. These can be adjusted via P3001 to P3008. The setpoint can be changed directly in 1% increments using + and −.

The info line is located above the function buttons:

Symbol	Description
I-LIM	Current limit is active
V-LIM	Voltage limit is active
STOP	Enable is active, but the feeder is stopped by a control module (e.g. level control)
RED	The setpoint reduction is active
SVO	The SVO function is active

Main Menu

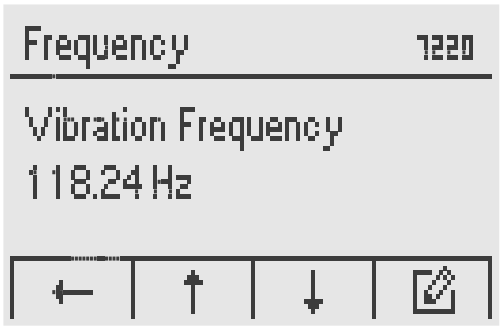


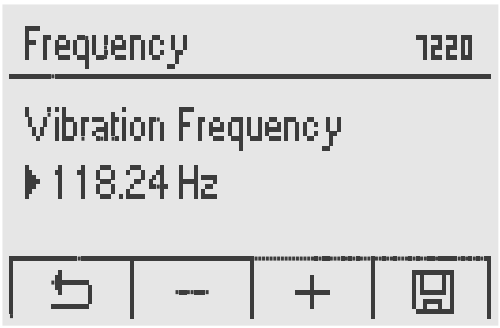
Menu Item	Description
All Parameters	Opens the parameter menu
Messages	Opens the message page (warning or error messages)
I/O Overview	Opens the I/O overview
Setpoint	Quick access to the setpoint
Frequency	Quick access to the vibration frequency
Resonance Search	Starts the resonance search

Parameter Menu (Group Level)

All parameter groups are listed here.

Parameter Menu (Parameter Level)





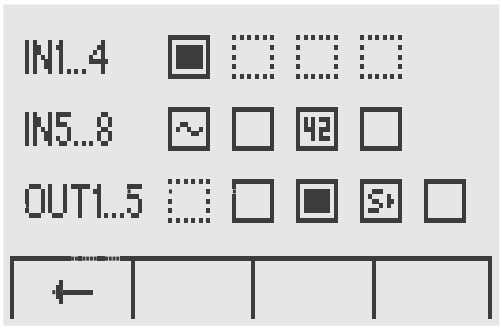
At this level, you can scroll through all parameters of the respective group. The group name is displayed in the header, with the parameter name and parameter value below it. The parameter address is displayed at the top right.

For numerical values, there are various options for adjustment using the + and − buttons:

Single click	Last digit is changed by 1
Press and hold	Value is constantly and slowly adjusted until the button is released
Double-click and hold	Value is adjusted with increasing speed until the button is released
Hold down + and press –	Value is set to maximum
Hold down – and press +	Value is set to minimum
Hold down + and – simultaneously for at least 1.5s	Value is reset to default

In addition, the default value can be called up for all parameters by pressing + and – simultaneously for at least 1.5 seconds.

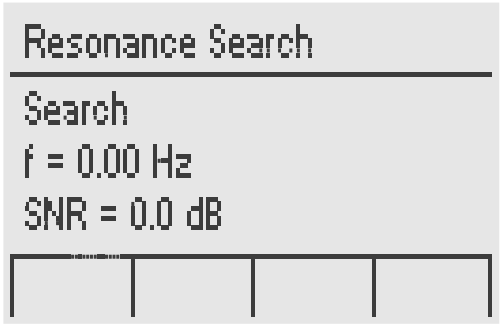
I/O Overview



An overview of all control inputs and outputs is displayed on this page:

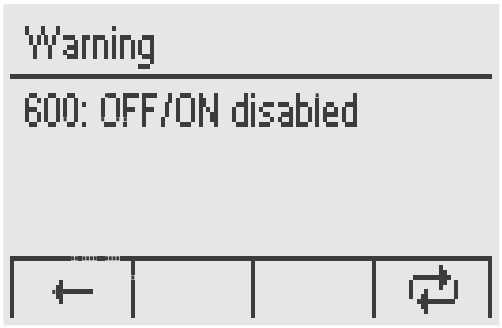
Symbol	Description
	Input or output is not configured
	Input: Configured as digital input and input level = 0 Output: Output level = 0
	Input: Configured as digital input and input level = 1 Output: Output level = 1
	Input is configured as an analog input, input level is displayed as a percentage (display range is limited to 00…99)
	Input is configured as acceleration sensor input
	Input is configured as synchronization input
	Output is configured as synchronization output

Resonance Search



This page is displayed when the resonance search has been started. The state (P8230), the frequency result (P8235) and the signal-to-noise ratio (P8236) are displayed.

Warning and Error Messages



This page is displayed when a warning or an error has been triggered. Up to three messages can be shown (corresponding to P0080 *Message 1* through P0082 *Message 3*)

6 Setup

6.1 First Steps

Variant A: Enable via OFF/ON buttons

1. Connect magnet output to electromagnet.
2. Connect mains input.
3. Switch on the device.
4. Change P0060 *Language*, if required.
   Main menu → All Parameters → General → Language or
   Main menu → Alle Parameter → Allgemein → Sprache
5. If settings have already been changed:
   Activate PF100 *Load Factory Settings* and restart the device.
   Main menu → All Parameters → Memory → Load Factory Settings
6. Set P7301 *Rated Current* to the rated current of the electromagnet.
   Observe the notes in chapter 7.10.
   Main menu → All Parameters → Magnet Drive → Rated Current
7. Set P7220 *Vibration Frequency*.
   Function button *F* or
   Main menu → Frequency or
   Main menu → All Parameters → Frequency → Vibration Frequency
8. Set P7120 *Setpoint*. 100% corresponds to approx. 250V with standard settings.
   Function buttons +/− or
   Main menu → Setpoint or
   Main menu → All Parameters → Setpoint → Setpoint
9. Press the *ON* button.

Variant B: Enable via OFF/ON buttons, with acceleration sensor

1. Install acceleration sensor SP01144 and connect it to INx (x = 5…8).
2. Connect magnet output to electromagnet.
3. Connect mains input.
4. Switch on the device.
5. Change P0060 *Language*, if required.
   Main menu → All Parameters → General → Language or
   Main menu → Alle Parameter → Allgemein → Sprache
6. If settings have already been changed:
   Activate PF100 *Load Factory Settings* and restart the device.
   Main menu → All Parameters → Memory → Load Factory Settings
7. Set P7301 *Rated Current* to the rated current of the electromagnet.
   Observe the notes in chapter 7.10.
   Main menu → All Parameters → Magnet Drive → Rated Current

8. Configure input for acceleration sensor: Set P500x *INx Mode* to “Acceleration Sensor”.
   Main menu → All Parameters → Inputs → INx Mode
9. Select input of acceleration sensor: Set P7401 *Sensor Source for AFC/RS* to “INx”.
   Main menu → All Parameters → Acceleration Sensor → Sensor Source for AFC/RS
10. Activate the controller: Set P8001 *AFC Mode* to “Amplitude + Frequency”.
    Main menu → All Parameters → A/F Controller → AFC Mode
11. Assign the resonance search to function button (optional): Set P3001 *F1 Button Function* to “Resonance Search”.
    Main menu → All Parameters → Display/Buttons → F1 Button Function
12. Run the resonance search.
    Function button *RS* or
    Main menu → Resonance Search
    Main menu → All Parameters → Resonance Search → Start RS
13. Set P7120 *Setpoint*. 100% corresponds to 10g with standard settings.
    Function buttons *+/−* or
    Main menu → Setpoint or
    Main menu → All Parameters → Setpoint → Setpoint
14. Press the *ON* button.

Variant C: External enable signal

1. Connect enable signal to INx (x = 1…8).
2. Connect magnet output to electromagnet.
3. Connect mains input.
4. Switch on the device.
5. Change P0060 *Language*, if required.
6. If settings have already been changed:
   Activate PF100 *Load Factory Settings* and restart the device.
7. Set P7301 *Rated Current* to the rated current of the electromagnet.
   Observe the notes in chapter 7.10.
8. Configure input for enable signal: Set P500x *INx Mode* to “Digital 24V”.
9. Assign the enable signal: Set P7020 *External Enable Source* to “INx”.
10. Set P7220 *Vibration Frequency*.
11. Set P7120 *Setpoint*. 100% corresponds to approx. 250V with standard settings.
12. Activate the enable signal.

Variant D: External enable signal, with acceleration sensor

1. Connect enable signal to INx (x = 1…8).
2. Install acceleration sensor SP01144 and connect it to INy (y = 5…8).
3. Connect magnet output to electromagnet.
4. Connect mains input.

5. Switch on the device.
6. Change P0060 *Language*, if required.
7. If settings have already been changed:
   Activate PF100 *Load Factory Settings* and restart the device.
8. Set P7301 *Rated Current* to the rated current of the electromagnet.
   Observe the notes in chapter 7.10.
9. Configure input for enable signal: Set P500x *INx Mode* to “Digital 24V”.
10. Assign the enable signal: Set P7020 *External Enable Source* to “INx”.
11. Configure input for acceleration sensor: Set P500y *INy Mode* to “Acceleration Sensor”.
12. Select input of acceleration sensor: Set P7401 *Sensor Source for AFC/RS* to “INy”.
13. Activate the controller: Set P8001 *AFC Mode* to “Amplitude + Frequency”.
14. Run the resonance search: Click P8201 *Start RS*.
15. Set P7120 *Setpoint*. 100% corresponds to 10g with standard settings.
16. Activate the enable signal.

6.2 Inputs and Outputs

→ Parameters: Chapter 7.3 and 7.4

The device has considerably more input and output functions than physical inputs and outputs. The functions are therefore not permanently assigned to specific inputs and outputs, but must be configured depending on the application.

For the inputs, the type of input must first be defined via P500x *INx Mode* (x = 1…8). The input signal is then selected as the source in the respective module.

For the outputs, the output functions are selected via P520x *OUTx Source* (x = 1…5).

6.3 Logic Gates

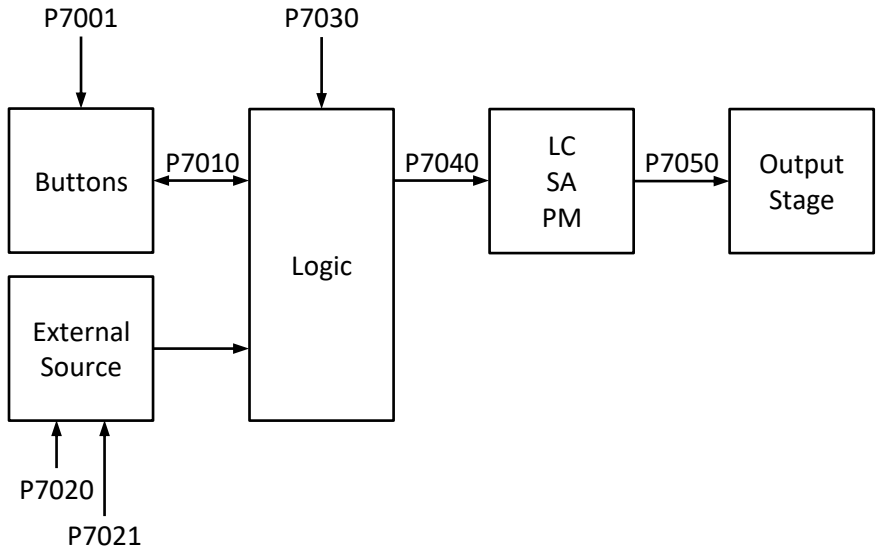
→ Parameters: Chapter 7.5

Three logic gates with up to three inputs are available for combining multiple digital signals.

6.4 Enable Signal

→ Parameters: Chapter 7.7

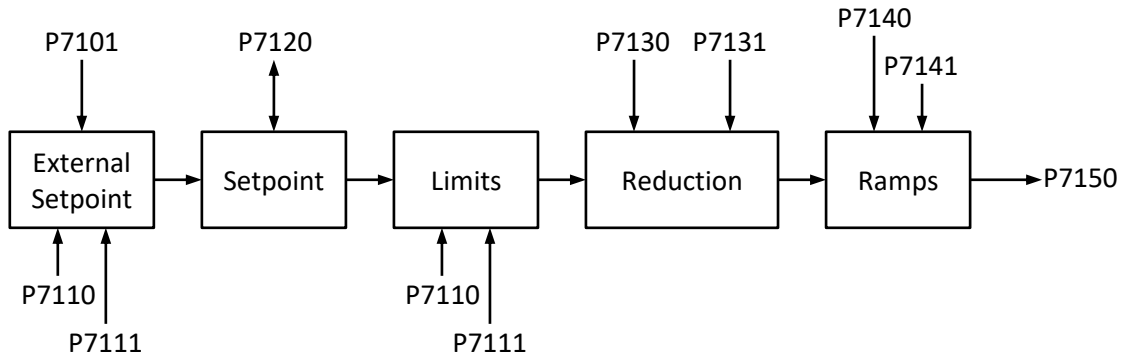
Various sources can be selected for the enable signal. These can also be combined with each other via the logic modules.



6.5 Setpoint

→ Parameters: Chapter 7.8

The setpoint can be set internally and externally. If the amplitude controller is not active, the setpoint is used directly to set the output voltage. If the amplitude controller is active, the acceleration amplitude is set via the setpoint. Coarse/fine feeding (e.g. feeding onto a weighing scale) can be realized with the setpoint reduction.



6.6 Acceleration Sensor

→ Parameters: Chapter 7.11

An acceleration sensor is required to use the amplitude and frequency controller and the resonance search.

The following points must be observed during installation:

- The sensor must be rigidly connected to the feeder so that it has no own resonance.
- With bowl feeders, the sensor should be installed as far away from the center as possible (e.g. in the area of the outlet), as the signal is highest here and corresponds to what is acting on the conveyed material.

- The sensor should be mounted in such a way that the direction of vibration corresponds approximately to the measuring direction specified in the sensor data sheet. For normal bowl and linear feeders, it is sufficient to mount the sensor horizontally, so that only the horizontal vibration component is measured.

In addition to SP01144, sensors from other manufacturers can also be used if they meet the following requirements:

Measured quantity	Instantaneous acceleration
Output type	Analog voltage output
Operating voltage	24V
Output offset at 0g	8…16V
Sensitivity	Depends on application, 1…5V output amplitude at operating point
Bandwidth (−3dB)	> 2 × vibration frequency
Pin assignment M12 connector, (IP54 devices only)	Pin 1: +24V Pin 2: Output signal Pin 3: GND

For test purposes, up to four sensors can be evaluated in parallel.

6.7 Resonance Search

→ Parameters: Chapter 7.13

The resonance search can be used to quickly and easily determine the resonance frequency of the connected feeder. To do this, an acceleration sensor must be installed (see chapter 6.6) and P7301 *Rated Current* must be set to the rated current of the electromagnet. For drives with permanent magnets, P7302 *Drive with Permanent Magnet* must also be activated.

The following options are available for starting the resonance search:

- Display: Press function button *RS*
- Display: Select *Main menu* → *Resonance Search*
- Display: Activate *Main menu* → *All Parameters* → *Resonance Search* → *Start RS*
- MEDI: Click P8201 *Start RS*
- Positive signal edge on the input selected via P8202 *RS Start Source*

The detected frequency and the signal-to-noise ratio (SNR) are then shown in the display and in the parameter group *Resonance Search*. If the following conditions are met, the frequency is automatically copied to P7220 *Vibration Frequency*:

- Frequency is in the range 5…500Hz
- Signal-to-noise ratio is at least 10dB

The detected frequency may deviate slightly from the resonant frequency in feeding operation. This is due to non-linear spring characteristics and the resulting dependence of the resonance frequency on the vibration amplitude. A higher amplitude is generally achieved during feeding operation than during the resonance search. However, the frequency controller compensates the deviation after a short time while the feeder is operating.

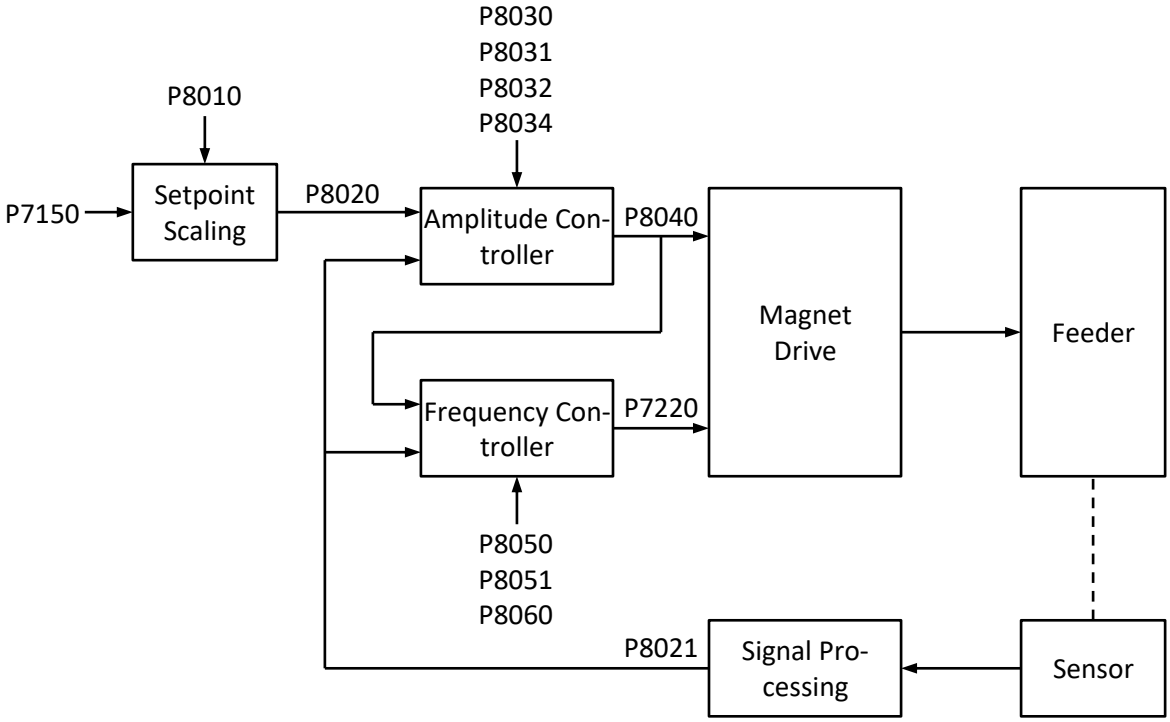
If the minimum signal-to-noise ratio is not reached, this may have the following causes:

- The feeder is heavily damped by the material being conveyed. If applicable, repeat the resonance search with an empty feeder.
- The acceleration sensor is installed at an unsuitable location or in an unsuitable direction (chapter 6.6).
- The feeder is incorrectly dimensioned or defective and therefore has no resonant frequency.

6.8 Amplitude/Frequency Controller

→ Parameters: Chapter 7.12

The amplitude controller enables operation with a constant acceleration amplitude. At the same time, the feeder is permanently operated at its resonance frequency by the frequency controller and therefore works with maximum efficiency. An acceleration sensor must be installed in order to use the amplitude and frequency controller (see chapter 6.6). To switch on the amplitude and frequency controller, P8001 *AFC Mode* must be set to "Amplitude + Frequency".

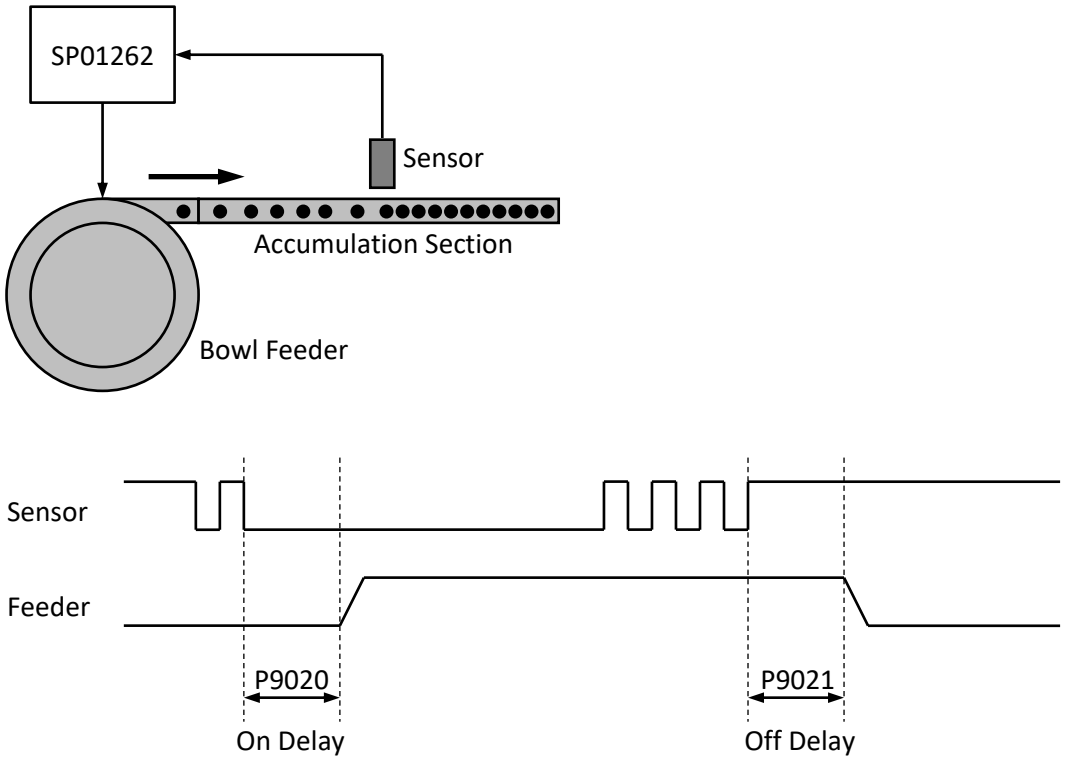


6.9 Level Control

→ Parameters: Chapter 7.14

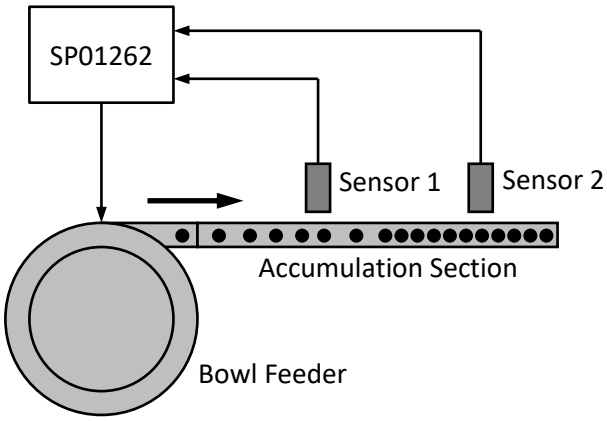
The level controller can be used to control the material flow in a downstream accumulation section in order to avoid unnecessary feeder operation (reduced wear of the conveyed material, energy consumption, noise emission). Typically, one or two material sensors are attached to an accumulation section for this purpose and the upstream bowl feeder is controlled via these sensors.

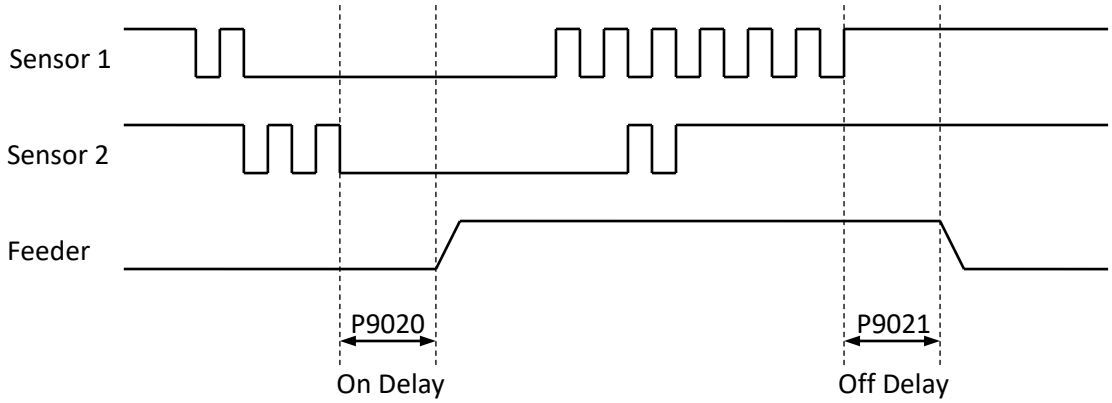
One Sensor



When operating with one sensor, the level always oscillates around the sensor, depending on the delay times.

Two Sensors





When operating with two sensors, the level always oscillates between the sensors and depends on the delay times. The feeder starts if sensor 2 does not detect any material for the time P9020 *LC On Delay* and stops if both sensors detect material for the time P9021 *LC Off Delay*.

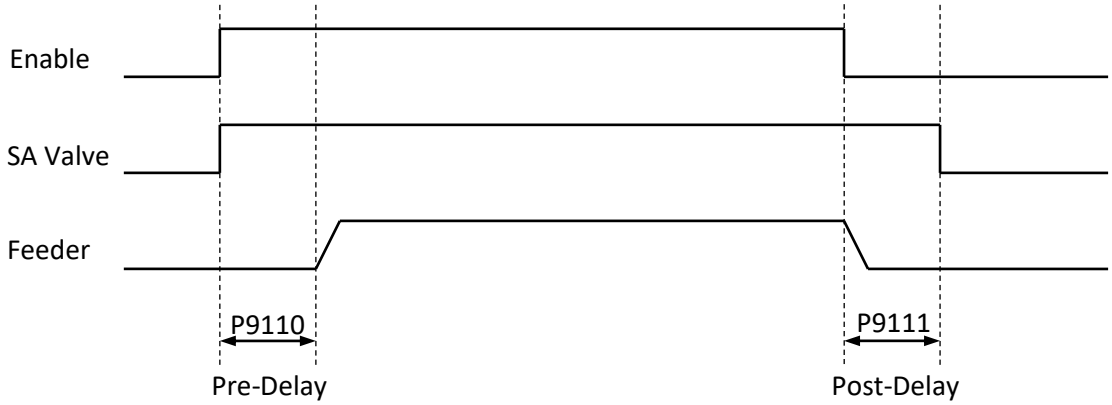
Timeout

In addition, P9030 *LC Timeout Mode* and P9031 *LC Timeout* can be used to set how the level control reacts if the feeder runs empty and no material is detected for a longer period of time.

6.10 Sorting Air

→ Parameters: Chapter 7.15

The sorting air controller can be used to control a pneumatic valve. The controller ensures that the valve is always switched on before the feeder starts and is only switched off after the feeder stops.



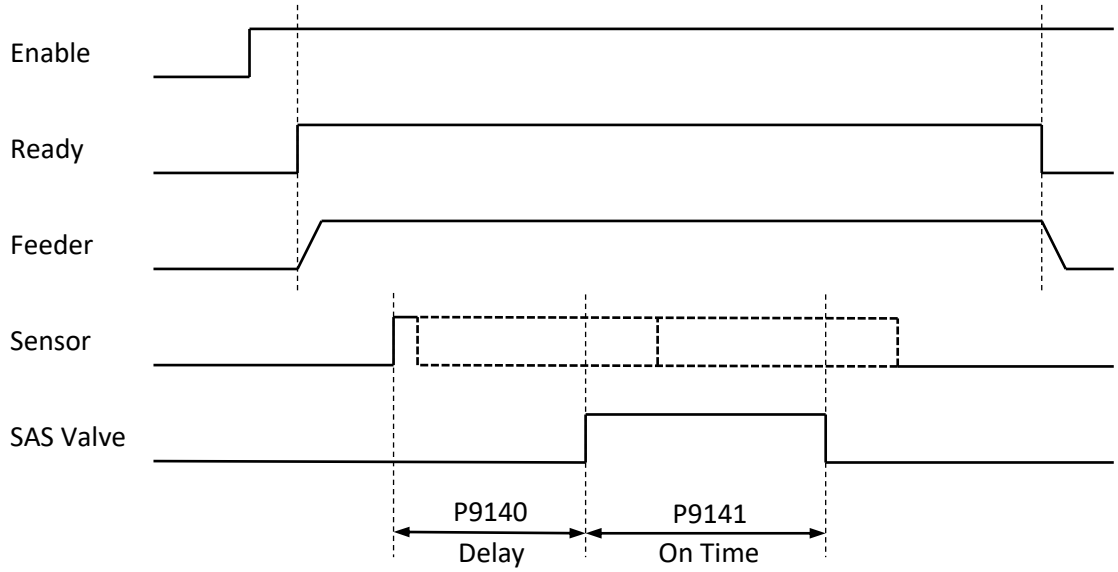
Besides the parameters of group *Sorting Air*, P52x0 *OUTx Source* (x = 1...5) must be set to “SA Valve”.

6.11 Sorting Air with Sensor

→ Parameters: Chapter 7.16

The sorting air with sensor control module is designed for the active sorting of parts using a sensor (e.g. fiber optic sensor or camera) and compressed air. In this setup, the sensor signal triggers a

pneumatic valve in a defined time sequence. For sensors that are not immediately ready for operation after being switched on, a ready signal can also be evaluated. The feeder then only starts when this signal is present, thereby preventing unsorted parts from being transported.

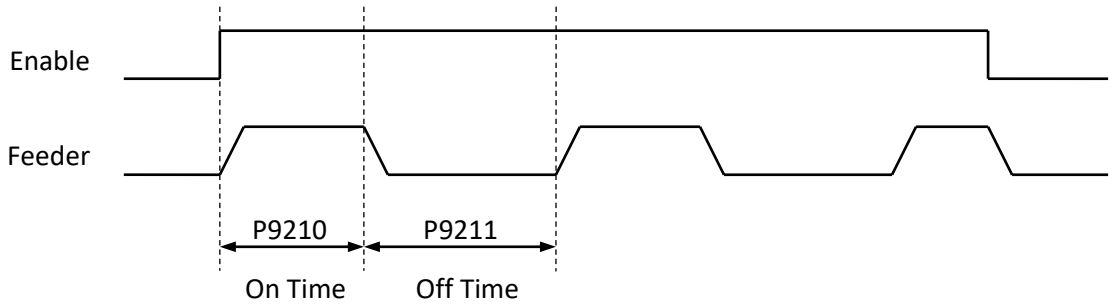


Besides the parameters of group *Sorting Air*, P52x0 *OUTx Source* (x = 1...5) must be set to “SAS Valve”.

6.12 Pulse Mode

→ Parameters: Chapter 7.17

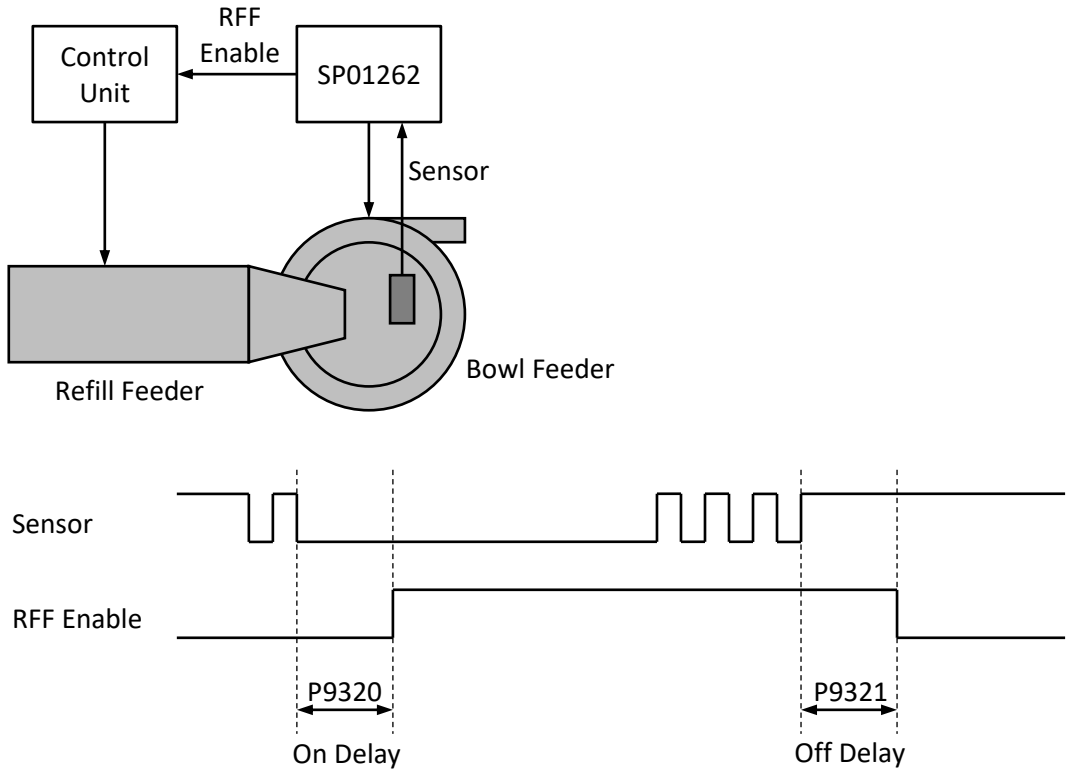
In pulse mode, the feeder is switched on and off cyclically.



6.13 Refill Feeder

→ Parameters: Chapter 7.18

The refill feeder controller can be used to control an upstream feeder that refills a bowl feeder, for example. This controller is similar to the level control, except that it generates the enable signal for another control unit for the upstream feeder.



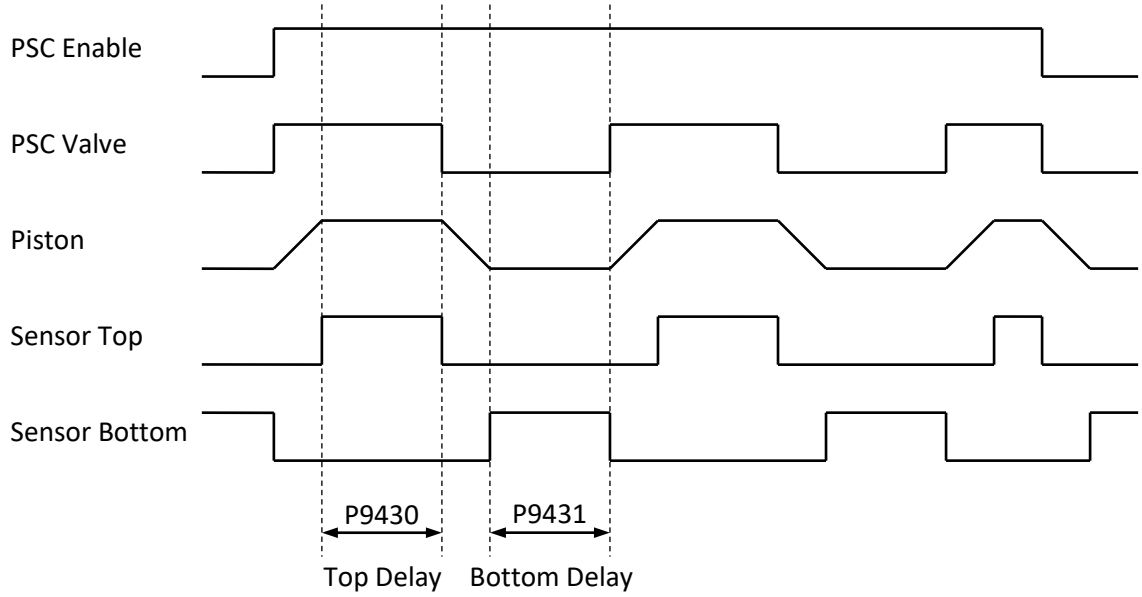
If no material is detected for the time P9320 *RFF On Delay*, the controller switches the refill feeder on. If material is detected for the time P9321 *RFF Off Delay*, the controller switches the refill feeder off. Besides the parameters of group *Refill Feeder*, P52x0 *OUTx Source* (x = 1...5) must be set to “RFF Enable”.

In addition, P9330 *RFF Timeout Mode* and P9331 *RFF Timeout* can be used to set how the refill feeder control reacts if the feeder runs empty and no material is detected for a longer period of time.

6.14 Pneumatic Step Conveyor

→ Parameters: Chapter 7.19

This control is an extension of the refill feeder controller, which allows the valve of a pneumatically driven step feeder to be controlled directly.



The use of cylinder sensors is optional. Without sensors, the delay times start directly when the valve toggles.

Besides the parameters of group *Pneumatic Step Conveyor*, P52x0 *OUTx Source* (x = 1...5) must be set to “PSC Valve”.

6.15 Signal Lights

→ Parameters: Chapter 7.20

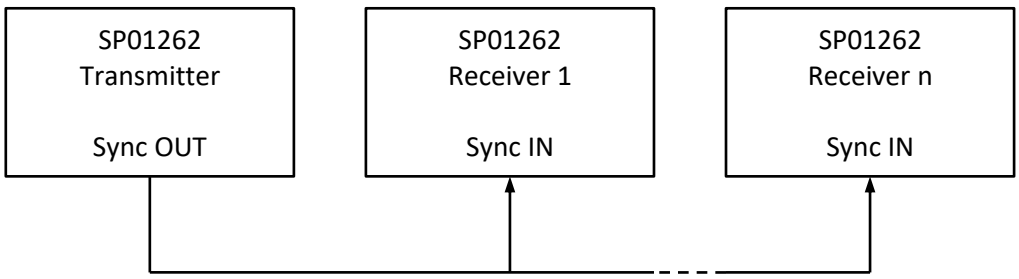
Up to three signal lights can be controlled independently of each other. Each signal light module has one input for static control and one input for flashing control. The priority of the inputs and the flashing frequency are adjustable.

6.16 Synchronization

→ Parameters: Chapter 7.6

Synchronization can be used to synchronize the frequency and phase position of two or more devices for special applications. Optionally, the enable signal and the setpoint can also be transmitted via the same signal. The suitability of the synchronization must be checked in the respective application.

Synchronization is achieved via a normal digital output (OUT1…4) on the transmitter device and a normal digital input (IN1…8) on the receiver devices.



Sender Device

- Defines the frequency, phase and optional enable and setpoint for the receivers.
- The synchronization output is activated by setting P52x0 *OUTx Source* (x = 1…4) to "Synchronization".
- The phase offset relative to the synchronization signal can be adjusted via P6020 *Phase Offset*.

Receiver Device

- Receives the frequency and phase position from the transmitter.
- The synchronization input is activated by setting P50x0 *INx Mode* (x = 1…8) to "Synchronization" and selecting it via P6010 *Sync Input Source*.
- The phase offset relative to the synchronization signal can be adjusted via P6020 *Phase Offset*.

Transmission speed

Due to the type of transmission, there is a slight delay in frequency, enable signal and setpoint. This delay is at least 65ms and up to 1/P7221. In most applications, this can be neglected.

Application: Synchronization of Multiple Devices on the Same Feeder

If a feeder has multiple electromagnets and the required current is too high for one device, multiple devices can be used in parallel to increase the current. To do this, each electromagnet or group of electromagnets is connected to a separate device and the devices are synchronized with each other.

Please note the following when open-loop operation is used:

- All devices should be operated with the same setpoint. To do this, set P6002 *Sync Output Setpoint* to "Setpoint" in the transmitter device and P7101 *External Setpoint* to "Synchronization" in the receiver devices.

Please note the following when using the amplitude/frequency controller:

- The amplitude/frequency controller may only be activated on the transmitter device.
- In order for all devices to be controlled by the amplitude controller, P6002 *Sync Output Setpoint* must be set to "Amplitude Controller Output" on the transmitter device and P7101 *External Setpoint* must be set to "Synchronization" on the receiver devices.

Application: Synchronization of Multiple Feeders

If two non-synchronized feeders are connected one after the other, an oscillating air gap occurs at the transition point due to the beating of the two vibration frequencies. This effect can be largely suppressed by synchronizing the frequency and phase position of both feeders.

Please note the following:

- The feeders must be mechanically tuned to the same resonant frequency.
- The frequency controller must be deactivated for all devices. The amplitude controller can be used on every device.

7 Parameters

7.1 General

P...	Name	Factory Setting	Min	Max	Unit	Type
0010	FW Version					👁
0020	HW Version					👁
0021	HW Variant					👁
002A	SW Options					👁
0030	Serial Number					👁
0040	Comment					⚙
0050	Address	1	1	223		⚙
0060	Language	German				⚙
0070	Status					👁
0080	Message 1					👁
0081	Message 2					👁
0082	Message 3					👁
1000	DC-Link Voltage				V	👁
1001	Undervoltage Threshold				V	👁
1010	Output Stage Temperature				°C	👁
1100	SVO1					👁
1110	SVO2					👁

P0010 FW Version

Version of the firmware.

P0020 HW Version

Version of the hardware.

P0021 HW Variant

Variant of the hardware (2nd section of the type designation).

P002A SW Options

Software options (3rd section of the type designation).

P0030 Serial Number

Serial number of the device.

P0040 Comment

User-defined comment. This parameter can only be edited via MEDI. While MEDI can handle most UTF characters, the internal display can only show ASCII characters and the following special characters: ä Ä ö Ö ü Ü ß ° µ

P0050 Address

Sets the device address. Can be used for differentiation if multiple devices are accessed simultaneously with MEDI. Has no function otherwise.

P0060 Language

Selects the language of the internal display and parameter window in MEDI.

Value	Description
German	User interface language is German.
English	User interface language is English.

P0070 Status

Shows the status of the device.

Value	Description
Pre-Charge	DC-link capacitors are being pre-charged.
Ready	The device is operating, but the output stage is not enabled.
Enable Signal on	The output stage is enabled.
SVO active	SVO is active, output stage can not be enabled.
Warning	A warning message is active, output stage can still operate.
Error	An error message is active, output stage can not be enabled.

P0080, P0081, P0082
Message 1…3

Shows up to three warning or error messages. P0080 shows the message that was triggered first. See chapter 9 for more information.

P1000 DC-Link Voltage

Shows the DC-link voltage.

P1001 Undervoltage Threshold

Shows the DC-link undervoltage threshold. The threshold is calculated based on the input voltage, when the device is powered up. The threshold is set 60V lower than the initial DC-link voltage, with an absolute minimum of 95V.

P1010 Output Stage Temperature

Shows the temperature of the output stage. A temperature above 85°C will trigger an overtemperature error.

P1100, P1110 SVO1…2

Shows the digital state of the SVO inputs. When the device has no SVO option installed, these parameters always show “HIGH”.

Value	Description
LOW	There is no voltage at the SVO input, output stage is disabled via the hardware.
HIGH	Voltage is applied to the SVO input, output stage is not disabled via the hardware.

7.2 Display/Buttons

This parameter group is only relevant for the device variants with display and buttons.

The following parameters can, among other things, block access to the main menu or disable write access to the parameter menu. Access via USB/MEDI is not affected by this.

Additionally, emergency access via the display is available if no PC with MEDI is available. To do this, the device must first be switched off until the display turns off. Then press and hold OFF and F1, switch the device back on and double-click F4 while the start page is displayed. The parameter menu is now displayed with write access until it is exited again.

P…	Name	Factory Setting	Min	Max	Unit	Type
3001	F1 Button Function	Frequency				⚙
3002	F2 Button Function	Decrease Set-point				⚙
3003	F3 Button Function	Increase Setpoint				⚙
3004	F4 Button Function	Menu				⚙
3005	F1 Custom	9001	0000	FFFF		⚙
3006	F2 Custom	9001	0000	FFFF		⚙
3007	F3 Custom	9001	0000	FFFF		⚙
3008	F4 Custom	9001	0000	FFFF		⚙
3010	Parameter Menu Write Access	Activated				⚙
3011	Change Numeric Values Directly	Activated				⚙

P3001, P3002, P3003, P3004
F1…4 Button Function

Sets the function of the function buttons on the main page.

Value	Description
No Function	The button has no function.
Menu	The button opens the main menu.
Increase Setpoint	The button increases the setpoint (P7120) by 1%.
Decrease Setpoint	The button decreases the setpoint (P7120) by 1%.
Setpoint	The button opens the quick access to P7120 *Setpoint*.
Frequency	The button opens the quick access to P7220 *Vibration Frequency*.
Rated Current	The button opens the quick access to P7301 *Rated Current*.
Resonance Search	The button starts the resonance search.
Custom	The button opens the quick access to the parameter specified in P3005 to P3008.

Using these parameters, it is also possible to completely block access to the main menu by not configuring any of the buttons with “Menu”.

P3005, P3006, P3007, P3008
F1…F4 Custom

Specifies the parameter address for the custom quick access via the corresponding function button.

P3010 Parameter Menu Write Access

Activates or deactivates the write access to the parameter menu.

P3011 Change Numeric Values Directly

Specifies whether changes to numeric parameters take effect immediately or only after the changes are saved.

7.3 Inputs

P...	Name	Factory Setting	Min	Max	Unit	Type
5001	IN1 Mode	OFF				⚙
5002	IN2 Mode	OFF				⚙
5003	IN3 Mode	OFF				⚙
5004	IN4 Mode	OFF				⚙
5005	IN5 Mode	OFF				⚙
5006	IN6 Mode	OFF				⚙
5007	IN7 Mode	OFF				⚙
5008	IN8 Mode	OFF				⚙
5011	IN1 Voltage				V	👁
5012	IN2 Voltage				V	👁
5013	IN3 Voltage				V	👁
5014	IN4 Voltage				V	👁
5015	IN5 Voltage				V	👁
5016	IN6 Voltage				V	👁
5017	IN7 Voltage				V	👁
5018	IN8 Voltage				V	👁
5021	IN1 analog				%	👁
5022	IN2 analog				%	👁
5023	IN3 analog				%	👁
5024	IN4 analog				%	👁
5025	IN5 analog				%	👁
5026	IN6 analog				%	👁
5027	IN7 analog				%	👁
5028	IN8 analog				%	👁
5031	IN1 digital					👁
5032	IN2 digital					👁
5033	IN3 digital					👁
5034	IN4 digital					👁
5035	IN5 digital					👁
5036	IN6 digital					👁
5037	IN7 digital					👁
5038	IN8 digital					👁
50F0	C1 Offset	0	−1000	+1000	V	⚙
50F1	C1 Multiplier	0	−100	+100	%/V	⚙
50F2	C1 Shunt (300 Ohm)	Deactivated				⚙
50F3	C2 Offset	0	−1000	+1000	V	⚙
50F4	C2 Multiplier	0	−100	+100	%/V	⚙
50F5	C2 Shunt (300 Ohm)	Deactivated				⚙

P5001, P5002, P5003, P5004, P5005, P5006, P5007, P5008
IN1…8 Mode

Determines the behavior of the input.

Value	Description
OFF	The input is deactivated.
Acceleration Sensor	The input is used for an acceleration sensor. Only available on IN5…8.
Synchronization	The input is used for the synchronization signal from another device.
Digital 3.3V/5V	Digital input, low threshold is 1V, high threshold is 2V, 3mA current sink is enabled. Only use this mode for interfacing 3.3V or 5V logic signals.
Digital 3.3V/5V inv.	Same as *Digital 3.3V/5V*, but inverted.
Digital 24V	Digital input, low threshold is 5.5V, high threshold is 10.5V, 3mA current sink is enabled. Use this mode for normal 24V signals. The input characteristic complies with IEC 61131-2 type 1 and 3.
Digital 24V inv.	Same as *Digital 24V*, but inverted.

Value	Description
0…5V = 0…100%	Analog input, input impedance is >100kΩ. 0…5V is scaled to 0…100%.
0…10V = 0…100%	Analog input, input impedance is >100kΩ. 0…10V is scaled to 0…100%.
0…24V = 0…100%	Analog input, input impedance is >100kΩ. 0…24V is scaled to 0…100%.
0…20mA = 0…100%	Analog input, input impedance is 300Ω. 0…20mA is scaled to 0…100%. Only available on IN5…8.
4…20mA = 0…100%	Analog input, input impedance is 300Ω. 4…20mA is scaled to 0…100%. Only available on IN5…8.
C1	Use custom analog input range C1.
C2	Use custom analog input range C2.

P5011, P5012, P5013, P5014, P5015, P5016, P5017, P5018
IN1…8 Voltage

Displays the input voltage, independent of the input mode.

P5021, P5022, P5023, P5024, P5025, P5026, P5027, P5028
IN1…8 analog

Displays the scaled analog input value, depending on the input mode. The value is limited to 0…100%.

P5031, P5032, P5033, P5034, P5035, P5036, P5037, P5038
IN1…8 digital

Displays the digital input state, depending on the input mode.

Value	Description
OFF	Input state is 0.
ON	Input state is 1.

P50F0, P50F3
C1…2 Offset

Specifies the offset value for the custom input ranges. An input voltage equal to the offset is interpreted as 0%. However, this setting has no influence on the physical measurement range of the input.

The required offset can be calculated using the following formula:

$$Offset = V_1 - \frac{A_1 \cdot (V_2 - V_1)}{A_2 - A_1}$$

V_1 Input voltage in V (start value)
V_2 Input voltage in V (end value)
A_1 Analog value in % (start value)
A_2 Analog value in % (end value)

P50F1, P50F4
C1…2 Multiplier

Specifies the multiplier for the custom input ranges. The multiplier is applied after the offset and scales the input voltage to a percentage.

The required multiplier can be calculated using the following formula:

$$Multiplier = \frac{A_2 - A_1}{V_2 - V_1}$$

V_1 Input voltage in V (start value)
V_2 Input voltage in V (end value)
A_1 Analog value in % (start value)
A_2 Analog value in % (end value)

P50F2, P50F5
C1…2 Shunt (300 Ohm)

Enables the current shunt resistor on a custom range. The shunt has a resistance of 300Ω and therefore converts a current of 20mA to 6V. The shunt will be switched off for protection when the current rises above approximately 25mA. The shunt is only available on IN5…8.

7.4 Outputs

P...	Name	Factory Setting	Min	Max	Unit	Type
5201	OUT1 Source	OFF				⚙
5202	OUT2 Source	OFF				⚙
5203	OUT3 Source	OFF				⚙
5204	OUT4 Source	OFF				⚙
5205	OUT5 Source	OFF				⚙
5211	OUT1 Inverted	Not inverted				⚙
5212	OUT2 Inverted	Not inverted				⚙
5213	OUT3 Inverted	Not inverted				⚙
5214	OUT4 Inverted	Not inverted				⚙
5215	OUT5 Inverted	Not inverted				⚙
5221	OUT1 State					👁
5222	OUT2 State					👁
5223	OUT3 State					👁
5224	OUT4 State					👁
5225	OUT5 State					👁
52F0	24V Source	Automatic				⚙
52F1	24V Supply					👁
52F2	24V Voltage				V	👁

P5201, P5202, P5203, P5204, P5205
OUT1…5 Source

Selects the source for the output.

Value	Description
OFF	The output is permanently switched off.
ON	The output is permanently switched on.
Ready	The output is on when P0070 *Status* is “Ready”.
Ready or Enable Signal on	The output is on when P0070 *Status* is “Ready” or “Enable Signal on”.
Enable Before Control Modules	The output is on when P7040 *Enable Before Control Modules* is “ON”.
Enable After Control Modules	The output is on when P7050 *Enable After Control Modules* is “ON”.
SVO active	The output is on when the SVO function is active.
Warning	The output is on when a warning message is active.
Error	The output is on when an error message is active.
Voltage Limit	The output is on when the voltage limit is active.
Current Limit	The output is on when the current limit is active.

Value	Description
LC Timeout	The output is on when the level control module detected a timeout.
SA Valve	The output is controlled by the sorting air module.
SAS Valve	The output is controlled by the sorting air with sensor module.
RFF Enable	The output is controlled by the refill feeder module.
RFF Timeout	The output is on when the refill feeder module detected a timeout.
PSC Valve	The output is controlled by the pneumatic step conveyor module.
Signal Light 1…3	The output is controlled by the selected signal light module.
Synchronization	The output acts as the synchronization output. Only available on OUT1…4.
IN1…8	The output is directly controlled by a digital input.
Logic Gate 1…3	The output is controlled by the selected logic module.

P5211, P5212, P5213, P5214, P5215
OUT1…5 Inverted

Inverts the output.

P5221, P5222, P5223, P5224
OUT1…4 State

Displays the state of the output. The optional inversion is already taken into account here.

Value	Description
OFF	The output switched off (high impedance).
ON	The output switched on (connected to +24V).

P5225 OUT5 State

Displays the state of the relay output OUT5. The optional inversion is already taken into account here.

Value	Description
OFF	NC is connected to COM.
ON	NO is connected to COM.

P52F0 24V Source

Selects the source of the 24V supply.

The internal 24V power supply unit is designed so that it can be connected directly to an external source. However, if the voltage of this external source is slightly lower than that of the internal power supply, the internal power supply will operate permanently at its current limit. This leads to unnecessary heat generation in the device.

Value	Description
Automatic	The internal power supply unit is automatically activated if no voltage is detected at the +24V terminal 2 seconds after the mains supply is switched on.
Internal	The internal power supply unit is always active. This setting should be used if automatic detection causes problems in a specific application.
External	The internal power supply unit is always deactivated. This setting should be used if an external power supply is used.

P52F1 24V Supply

Indicates whether the internal 24V power supply is switched on.

Value	Description
OFF	Internal 24V power supply is switched off.
ON	Internal 24V power supply is switched on.

P52F2 24V Voltage

Displays the voltage of the 24V supply.

7.5 Logic Gates

P...	Name	Factory Setting	Min	Max	Unit	Type
5410	LG1 Source A	OFF				⚙
5411	LG1 Source B	OFF				⚙
5412	LG1 Source C	OFF				⚙
541A	LG1 Gate	A AND B				⚙
541B	LG1 Output					👁
5420	LG2 Source A	OFF				⚙
5421	LG2 Source B	OFF				⚙
5422	LG2 Source C	OFF				⚙
542A	LG2 Gate	A AND B				⚙
542B	LG2 Output					👁
5430	LG3 Source A	OFF				⚙
5431	LG3 Source B	OFF				⚙
5432	LG3 Source C	OFF				⚙
543A	LG3 Gate	A AND B				⚙
543B	LG3 Output					👁

P5410, P5411, P5412, P5420, P5421, P5422, P5430, P5431, P5432
LG1…3 Source A…C

Sources for the respective inputs of the logic modules.

Value	Description
OFF	The input is permanently OFF.
ON	The input is permanently ON.
IN1…8	The selected digital input is used as an input.
Logic Gate 1…3	The output of the selected logic module is used as an input.
Ready	The input is ON when P0070 *Status* is “Ready”.
Ready or Enable Signal on	The input is ON when P0070 *Status* is “Ready” or “Enable Signal on”.
Enable Before Control Modules	P7040 *Enable Before Control Modules* is used as an input.
Enable After Control Modules	P7050 *Enable After Control Modules* is used as an input.
SVO active	The input is ON when the SVO function is active.
Warning	The input is ON when a warning message is active.
Error	The input is ON when an error message is active.
Voltage Limit	The input is ON when the voltage limit is active.
Current Limit	The input is ON when the current limit is active.

Value	Description
LC Timeout	The timeout output of the level control module is used as an input.
SA Valve	The output of the sorting air module is used as an input.
SAS Valve	The output of the sorting air with sensor module is used as an input.
RFF Enable	The output of the refill feeder module is used as an input.
RFF Timeout	The timeout output of the refill feeder module is used as an input.
PSC Valve	The output of the pneumatic step conveyor module is used as an input.
Signal Light 1…3	The output of the selected signal light module is used as an input.
Fieldbus Enable	The enable signal from the fieldbus is used as an input.
Sync Enable	The enable signal from the synchronization is used as an input.

P541A, P542A, P543A
LG1…3 Gate

Selects the type of logic gate.

Value	Description
~A	NOT gate.
A AND B	AND gate.
A OR B	OR gate.
A XOR B	Exclusive OR gate.
A NAND B	AND gate with inverted output.
A NOR B	OR gate with inverted output.
A XNOR B	Exclusive OR gate with inverted output.
A AND ~B	AND gate, input B inverted.
A OR ~B	OR gate, input B inverted.
A AND B AND C	AND gate.
A OR B OR C	OR gate.
(A AND B) OR C	Combination of AND gate and OR gate. AND is evaluated first.
A AND (B OR C)	Combination of AND gate and OR gate. OR is evaluated first.
A ? B : C	If A, then B, otherwise C.

P541B, P542B, P543B
LG1…3 Output

Displays the output of the respective logic module.

Value	Description
OFF	Output state is 0.
ON	Output state is 1.

7.6 Synchronization

P…	Name	Factory Setting	Min	Max	Unit	Type
6001	Sync Output Enable	Enable Before Control Modules				⚙
6002	Sync Output Setpoint	Setpoint				⚙
6010	Sync Input Source	OFF				⚙
6011	Sync Input State					👁
6020	Phase Offset	0	0	359	°	⚙

P6001 Sync Output Enable

Selects the enable signal, that is transmitted via the synchronization output.

Value	Description
Enable Before Control Modules	P7040 *Enable Before Control Modules* is transmitted together with the synchronization signal.
Enable After Control Modules	P7050 *Enable After Control Modules* is transmitted together with the synchronization signal.

P6002 Sync Output Setpoint

Selects the setpoint, that is transmitted via the synchronization output.

Value	Description
Setpoint	P7120 *Setpoint* is transmitted together with the synchronization signal. This mode is used when multiple feeders should be synchronized, or when one feeder with multiple magnets should be driven by multiple devices to increase current, while the amplitude / frequency controller is not used.
Amplitude Controller Output	P8040 *Amplitude Controller Output* is transmitted together with the synchronization signal. This mode is used when one feeder with multiple magnets should be driven by multiple devices to increase current, while the amplitude / frequency controller is active in the transmitter device.

P6010 Sync Input Source

Selects the synchronization input.

Value	Description
OFF	Not input is selected. The device is not synchronized.
IN1…8	The device is synchronized to the selected input.

P6011 Sync Input State

Displays the state of the received synchronization signal.

Value	Description
OFF	The synchronization input is deactivated.
OK	An error-free signal is received.
No Signal	The synchronization input is activated, but no signal or a faulty signal is being received.

P6020 Phase Offset

Sets the phase offset relative to the synchronization signal.

Note: The phase offset refers to the output frequency. With conventional drives (which attract once per half-cycle), the behavior is the same at 0° and 180°, while at 90° and 270° the phase of the oscillation is reversed.

7.7 Enable Signals

P...	Name	Factory Setting	Min	Max	Unit	Type
7001	Initial State of OFF/ON Buttons	OFF				⚙
7010	OFF/ON Buttons State					👁
7020	External Enable Source	OFF				⚙
7021	External Enable Mode	Edge				⚙
7030	Enable Logic Mode	Buttons OR External				⚙
7040	Enable Before Control Modules					👁
7050	Enable After Control Modules					👁

P7001 Initial State of OFF/ON Buttons

Specifies the state in which the OFF/ON buttons should be after the device is powered up. The parameter has no effect if an error message or SVO is active when the device is powered up.

Value	Description
OFF	P7010 *OFF/ON Buttons State* is “OFF” after power up.
ON	P7010 *OFF/ON Buttons State* is “ON” after power up.

WARNING!

Risk of injury due to automatic start-up!

If P7001 is set to “ON”, the feeder can start up when a mains supply failure is restored.

➔ If the “ON” setting is to be used, check beforehand whether this is compliant with the applicable regulations in the specific application!

P7010 OFF/ON Buttons State

Displays the enable signal generated by the OFF/ON buttons. This state does not necessarily correspond to the illumination of the OFF/ON buttons, as these show the state of P7040.

Value	Description
OFF	The enable signal of the OFF/ON button is off.
ON	The enable signal of the OFF/ON button is on.

P7020 External Enable Source

Selects the source of the external enable signal.

Value	Description
OFF	The enable signal is permanently off.
ON	The enable signal is permanently on.
Fieldbus Enable	The enable signal from the fieldbus is used.
Sync Enable	The enable signal from the synchronization is used.
IN1…8	The selected digital input signal is used as the enable signal.
Logic Gate 1…3	The output of the selected logic module is used as the enable signal.

P7021 External Enable Mode

Specifies how the control unit reacts to the external enable signal.

Value	Description
Static	The enable signal is always activated when a signal is present.
Edge	The enable signal is only activated when the signal changes from off to on.

WARNING!

Risk of injury due to automatic start-up!

If P7021 is set to “Static”, the feeder can start up when a mains supply failure is restored or a fault is reset.

➔ If the “Static” setting is to be used, check beforehand whether this is compliant with the applicable regulations in the specific application!

P7030 Enable Logic Mode

Specifies how the OFF/ON buttons and the external enable signal should be linked.

Value	Description
Buttons	The OFF/ON buttons are used for the enable signal. The external enable signal is ignored.
External	The external enable signal is used. The OFF/ON buttons are ignored.
Buttons OR External	The OFF/ON buttons and the external enable signal are OR-linked. The state of the OFF/ON buttons is independent of the external enable signal.
Buttons AND External	The OFF/ON buttons and the external enable signal are AND-linked. The state of the OFF/ON buttons is independent of the external enable signal.
Buttons with Reset AND External	The OFF/ON buttons and the external enable signal are AND-linked. When the external enable signal is low, the OFF/ON buttons are set to “OFF”. Therefore an additional manual start via the ON button is required when the external enable signal goes high again.

P7040 Enable Before Control Modules

Shows the enable signal after the enable logic and before the control modules (level control, sorting air, pulse mode).

Value	Description
OFF	The enable signal is off.
ON	The enable signal is on.

P7050 Enable After Control Modules

Shows the enable signal after the control modules (level control, sorting air, pulse mode). This signal controls the output stage.

Value	Description
OFF	The enable signal is off.
ON	The enable signal is on.

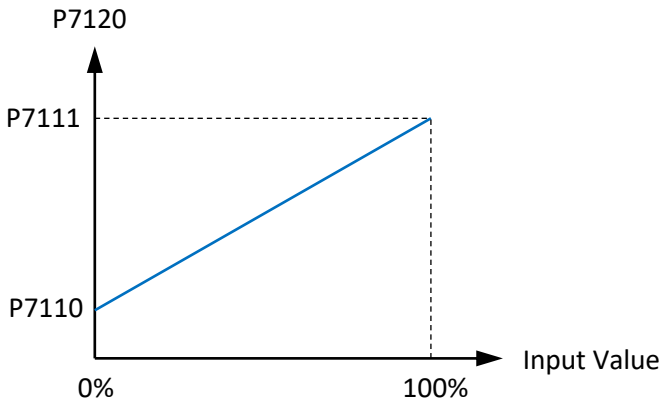
7.8 Setpoint

P…	Name	Factory Setting	Min	Max	Unit	Type
7101	External Setpoint	OFF				⚙
7110	Min. Setpoint	0	0	100	%	⚙
7111	Max. Setpoint	100	0	100	%	⚙
7120	Setpoint	50	P7110	P7111	%	👁 ⚙
7130	Setpoint Reduction	50	0	100	%	⚙
7131	Activate Setpoint Reduction	OFF				⚙
7140	Start Ramp	100	0	10000	ms	⚙
7141	Stop Ramp	100	0	10000	ms	⚙
7150	Setpoint after Ramps				%	👁

P7101 External Setpoint

Selects an external setpoint source.

The external setpoint is scaled via P7110 *Min. Setpoint* and P7111 *Max. Setpoint*:



Value	Description
OFF	The setpoint is set directly via P7120 *Setpoint*.
IN1…8	The setpoint is set via the selected analog input.
Fieldbus Setpoint	The setpoint is set via the fieldbus.
Sync Setpoint	The setpoint is set via the synchronization signal.

P7110 Min. Setpoint

Specifies the lower limit of the setpoint. This parameter is also used to scale the external setpoint.

P7111 Max. Setpoint

Specifies the upper limit of the setpoint. This parameter is also used to scale the external setpoint.

P7120 Setpoint

P7120 specifies the internal setpoint, when P7101 *External Setpoint* is set to “OFF”. If an external setpoint is selected via P7101, then P7120 displays the scaled setpoint.

P7130 Setpoint Reduction

Sets the setpoint reduction for coarse/fine control. When the reduction is active, the setpoint is multiplied with this value.

Example: Setpoint 70% and setpoint reduction 50% yields a setpoint of 35%.

P7131 Activate Setpoint Reduction

Selects the digital input, that activates the setpoint reduction.

Value	Description
OFF	The setpoint reduction is not active.
IN1…8	The setpoint reduction is activated when the selected digital input is ON.

P7140 Start Ramp

Specifies the duration of the start ramp.

P7141 Stop Ramp

Specifies the duration of the stop ramp.

P7150 Setpoint after Ramps

Displays the final setpoint after setpoint reduction and start/stop ramps.

7.9 Frequency

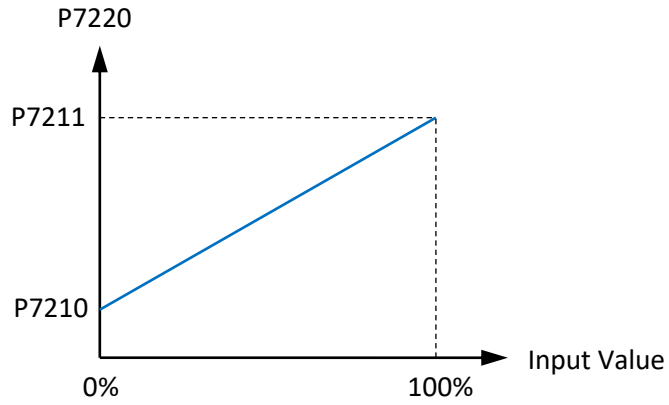
P…	Name	Factory Setting	Min	Max	Unit	Type
7201	External Frequency	OFF				⚙
7210	Min. Vibration Frequency	10	10 (1)	2000 (1)	Hz	⚙
7211	Max. Vibration Frequency	200	10 (1)	2000 (1)	Hz	⚙
7220	Vibration Frequency	100	P7210	P7211	Hz	👁 ⚙
7221	Output Frequency				Hz	👁

(1) The limits are halved when P7302 *Drive with Permanent Magnet* is activated.

P7201 External Frequency

Selects the source for an external frequency setting.

The external frequency setting is scaled via P7210 *Min. Vibration Frequency* and P7211 *Max. Vibration Frequency*:



This setting is ignored if the synchronization input is used.

Value	Description
OFF	The frequency is set directly via P7220 *Vibration Frequency*.
IN1…8	The frequency is set via the selected analog input.
Fieldbus Frequency	The frequency is set via the fieldbus.

P7210 Min. Vibration Frequency

Specifies the lower limit of the vibration frequency. This parameter is also used to scale the external frequency setting.

P7211 Max. Vibration Frequency

Specifies the upper limit of the vibration frequency. This parameter is also used to scale the external frequency setting.

P7220 Vibration Frequency

P7220 specifies the internal vibration frequency, when P7201 *External Frequency* is set to “OFF”. If an external frequency setting is selected via P7201, then P7220 displays this frequency.

P7221 Output Frequency

Displays the electrical output frequency. When P7302 *Drive with Permanent Magnet* is activated, this value is equal to P7220 *Vibration Frequency*. Otherwise the output frequency is half of the vibration frequency.

7.10 Magnet Drive

P...	Name	Factory Setting	Min	Max	Unit	Type
7301	Rated Current	1	0,1	10	A	⚙
7302	Drive with Permanent Magnet	Deactivated				⚙
7310	Waveform	Optimized Modulation				⚙
7311	Output Voltage Scaling	310	0	330	Vp	⚙
7320	Modulation Level				%	👁
7321	Voltage Limit					👁
7322	Current Limit					👁
7323	Error at Voltage Limit	Deactivated				⚙
7324	Error at Current Limit	Deactivated				⚙
7330	Output Voltage				V	👁
7331	Output Voltage				Vp	👁
7332	Output Current				A	👁
7333	Output Current				Ap	👁
7340	Magnet Saturation				%	👁
7350	Source Magnet Temp. Switch	OFF				⚙
7351	Magnet Overtemperature when	OFF				⚙

P7301 Rated Current

Specifies the rated current of the connected electromagnet or the sum of all electromagnets connected in parallel. The output current is automatically limited to this value so that the magnet cannot be thermally damaged.

ATTENTION!

Damage to the electromagnet if the rated current is set too high!

If the rated current is set incorrectly, the device can cause thermal damage to the electromagnet if, for example, the setpoint is set incorrectly or the acceleration control loop is interrupted.

➔ Always set P7301 to the sum of the rated currents of all electromagnets connected in parallel!

ATTENTION!

Damage to the magnets due to uneven current distribution!

If several magnets are connected in parallel, the current limiter can only reliably protect the magnets if an even current distribution is ensured.

➔ Only connect the same electromagnets with the same air gap in parallel!

For some electromagnets, the rated current is not specified directly. In this case, it can be calculated as follows:

$$Rated\ current\ in\ A = \frac{Rated\ apparent\ power\ in\ VA}{Rated\ voltage\ in\ V}$$

P7302 Drive with Permanent Magnet

Specifies whether the connected drive works with electromagnets that act on permanent magnets. With these drives, the electrical and mechanical frequency is the same, whereas with conventional drives, the mechanical frequency is twice the electrical frequency. This parameter is relevant for the correct display of the vibration frequency and the resonance search.

P7310 Waveform

Sets the waveform of the output voltage.

Value	Description
Sine	Pure sine wave: Recommended if the feeder reacts sensitive to the harmonics in the “Optimized Modulation” setting.
Optimized Modulation	Modified sine wave: Suitable for most feeders. The achievable output voltage is 13% higher than with “Sine”.
High Efficiency 1	Special waveform to reduce copper losses in the electromagnet: With the same mechanical vibration amplitude, the RMS current is approximately 20% lower than with “Sine” or “Optimized Modulation”. When dimensioning the electromagnet, it should be noted that the required output voltage is higher. The electromagnet must therefore be rated for lower voltages so that the required current can be introduced without the output stage reaching the modulation limit. This setting is not suitable for all feeders. While no acoustic difference is noticeable with some feeders, the high harmonic content can result in significantly higher noise levels with other feeders.

P7311 Output Voltage Scaling

Specifies the amplitude of the output voltage at 100% setpoint. This setting can be left at the default value in many applications.

Use Case 1:
For operation without A/F controller, this parameter can be used as an alternative to P7111 *Max. Setpoint*. By reducing P7311, the control range of the setpoint can be spread so that, for example, the maximum vibration amplitude is reached at 100%.

Use Case 2:
The maximum modulation of the output stage can be adapted to the nominal mains voltage using this parameter. This is particularly advantageous if, for example, a system is operated at 230V at the manufacturing site but at 120V in the final application. In this case, the scaling is set appropriately for 120V (see table below). This ensures that the device has the same output range for both mains voltages. For maximum reliability regarding mains voltage fluctuations and DC link ripple, P7311 should be reduced by an additional 20%.

Mains voltage (RMS)	P7311	P7311 (–20%)
100 V	134 V	107 V
110 V	148 V	118 V
120 V	161 V	129 V
220 V	295 V	236 V
230 V	309 V	247 V
240 V	322 V	258 V

If the A/F controller is used, the proportional term of the amplitude controller P8030 must be adjusted inversely proportional when P7311 is changed in order to achieve the same control response. Example: If P7311 is reduced from 300V to 150V, then P8030 must be increased by a factor of 2.

P7320 Modulation Level

Shows the modulation level of the output stage. The maximum modulation level is 100%.

The drive should be designed so that 80% is not exceeded during normal operation. Otherwise the modulation limit may be reached due to mains voltage fluctuations and DC link ripple, which will affect the feeding behavior.

P7321 Voltage Limit

Indicates whether the output voltage is limited.

Value	Description
OFF	The output voltage limit is not active.
ON	The output voltage limit is active. The device tries to generate an undistorted output voltage at maximum modulation. Slight distortions and beating may occur due to DC link ripple.

P7322 Current Limit

Indicates whether the output current is limited.

Value	Description
OFF	The output current limit is not active.
ON	The output current limit is active. The output current is limited to P7301 *Rated Current*.

P7323 Error at Voltage Limit

Specifies whether an error message should be triggered when voltage limiting is active.

P7324 Error at Current Limit

Specifies whether an error message should be triggered when current limiting is active.

P7330 Output Voltage

Displays the RMS output voltage.

P7331 Output Voltage

Displays the peak output voltage.

P7332 Output Current

Displays the RMS output current.

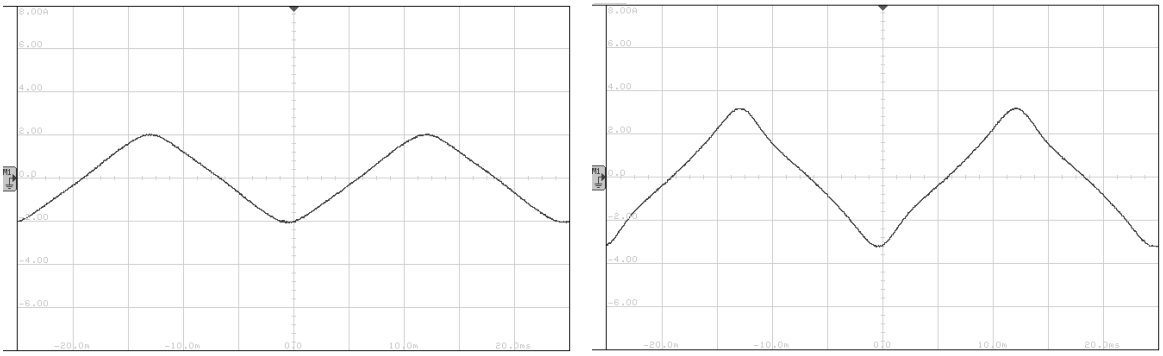
P7333 Output Current

Displays the peak output current.

P7340 Magnet Saturation

Indicates whether the core of the electromagnet is in saturation. As soon as the core of an electromagnet reaches saturation, the additional current barely contributes to the attraction force, while the copper losses continue to depend quadratically on the current. Therefore, with a correctly designed drive, this parameter should always show 0%.

The following examples show a magnet current at P7340=0% (left) and 100% (right):



This parameter is optimized for practical use and is not a standardized measured variable.

P7350 Source Magnet Temp. Switch

Selects the source of the temperature switch. The input signal is delayed by 3 seconds.

Value	Description
OFF	No temperature switch is monitored.
IN1…8	The selected digital input signal is used to monitor the temperature switch.
Logic Gate 1…3	The output of the selected logic module is used to monitor the temperature switch.

P7351 Magnet Overtemperature when

Selects the switching behavior of the temperature switch.

Value	Description
OFF	Normally closed contact between INx and +24V.
ON	Normally open contact between INx and +24V.

7.11 Acceleration Sensor

P…	Name	Factory Setting	Min	Max	Unit	Type
7401	Sensor Source for AFC/RS	IN5				⚙
7415	IN5 Acceleration				g	👁
7416	IN6 Acceleration				g	👁
7417	IN7 Acceleration				g	👁
7418	IN8 Acceleration				g	👁
7425	IN5 Vibration Amplitude				mm	👁
7426	IN6 Vibration Amplitude				mm	👁
7427	IN7 Vibration Amplitude				mm	👁
7428	IN8 Vibration Amplitude				mm	👁
74A5	IN5 Sensitivity	300	10	10000	mV/g	⚙
74A6	IN6 Sensitivity	300	10	10000	mV/g	⚙
74A7	IN7 Sensitivity	300	10	10000	mV/g	⚙
74A8	IN8 Sensitivity	300	10	10000	mV/g	⚙
74B0	Min. Offset	4	0	24	V	⚙
74B1	Max. Offset	20	0	24	V	⚙

P7401 Sensor Source for AFC/RS

Selects the acceleration sensor input for the A/F controller and the resonance search.

Value	Description
IN5…8	The selected input is used for the A/F controller and the resonance search.

P7415, P7416, P7417, P7418
IN5…8 Acceleration

Displays the peak amplitude of the measured acceleration.

P7425, P7426, P7427, P7428
IN5…8 Vibration Amplitude

Shows the vibration amplitude, which is calculated from the measured acceleration.

P74A5, P74A6, P74A7, P74A8
IN5…8 Sensitivity

Specifies the sensitivity of the acceleration sensor. This value can be found in the technical data of the specific sensor.

P74B0 Min. Offset

Lower limit of the DC voltage offset from the acceleration sensor. The DC voltage component is evaluated for error detection when A/F controller or resonance search is active.

P74B1 Max. Offset

Upper limit of the DC voltage offset from the acceleration sensor. The DC voltage component is evaluated for error detection when A/F controller or resonance search is active.

7.12 Amplitude/Frequency Controller

P…	Name	Factory Setting	Min	Max	Unit	Type
8001	AFC Mode	OFF				⚙
8010	Acceleration Setpoint Scaling	10	0	100	g	⚙
8020	Acceleration Setpoint				g	👁
8021	Actual Acceleration				g	👁
8030	Amplitude Controller P	1	0	100	%/g	⚙
8031	Amplitude Controller I	5	0	100	s^{-1}	⚙
8034	Amplitude Controller D	0	0	100	s	⚙
8032	Open-Loop Start	Deactivated				⚙
8033	Next Start					👁
8040	Amplitude Controller Output				%	👁
8050	Frequency Controller t	1	0,5	60	s	⚙
8051	Frequency Controller w	0,1	0,001	1	%	⚙
8060	Frequency Monitoring	Deactivated				⚙

P8001 AFC Mode

Selects the operating mode of the amplitude and frequency controller.

Value	Description
OFF	Both controllers are switched off, the setpoint sets the output voltage directly.
Amplitude + Frequency	Amplitude and frequency controllers are both active at the same time. This is the normal controlled operating mode. The amplitude controller adjusts the output voltage so that the measured acceleration amplitude matches the setpoint. The frequency controller simultaneously optimizes the frequency so that the feeder always operates at its resonance frequency with maximum efficiency.
Amplitude	Only the amplitude controller is active. Can be used for test purposes or if the frequency is defined by another device via synchronization.
Frequency	Only the frequency controller is active. Generally only suitable for test purposes.

P8010 Acceleration Setpoint Scaling

Defines the acceleration in g at 100% setpoint.

$1g = 9.81\frac{m}{s^2}$

P8020 Acceleration Setpoint

Displays the acceleration setpoint for the amplitude controller.

P8021 Actual Acceleration

Displays the peak amplitude of the measured acceleration. This is used as the actual value for the amplitude controller.

P8030 Amplitude Controller P

Sets the proportional term of the amplitude controller. The default value is suited for most applications. See chapter 8.1 for tuning.

P8031 Amplitude Controller I

Sets the integral term of the amplitude controller. The default value is suited for most applications. See chapter 8.1 for tuning.

P8034 Amplitude Controller D

Sets the differential term of the amplitude controller. The default value is suited for most applications. See chapter 8.1 for tuning.

P8032 Open-Loop Start

Defines how the amplitude controller reacts to the enable signal.

Value	Description
Deactivated	The feeder always starts in closed-loop mode depending on P8030, P8031 and P8034. This is normally slower than specified by P7140 *Start Ramp*.
Activated	The feeder starts in open-loop mode with the last output voltage and P7140 *Start Ramp*. After that, the amplitude controller is activated. The start is therefore independent of P8030, P8031 and P8034, except for the first time after a device restart.

WARNING!

Risk of injury due to high vibration amplitude!

If P8032 is activated, the amplitude controller starts with the last output value when enabled. If changes were made in the parameter group *Magnet Drive* while the enable signal was deactivated, an unexpectedly high output voltage may be generated.

➔ Always deactivate P8032 while changes are made in the parameter group *Magnet Drive*!

P8033 Next Start

Shows in conjunction with P8032, how the next start is done.

Value	Description
Closed-Loop	The next start will be closed-loop via the amplitude controller.
Open-Loop	The next start will be open-loop via the start ramp.

P8040 Amplitude Controller Output

Shows the output of the amplitude controller. When the A/F controller is activated, this value sets the output voltage instead of the setpoint P7150.

P8050 Frequency Controller t

Specifies the cycle time for the frequency controller. The default value is suited for most applications. See chapter 8.2 for tuning.

P8051 Frequency Controller w

Specifies the relative step width for the frequency controller. The default value is suited for most applications. See chapter 8.2 for tuning.

P8060 Frequency Monitoring

Switches the frequency monitoring on. The frequency monitoring checks whether the frequency controller stays within the frequency limits P7210 and P7211. This can be used for spring breakage detection if suitable limits are selected.

7.13 Resonance Search

P…	Name	Factory Setting	Min	Max	Unit	Type
8201	Start RS					⚙
8202	RS Start Source	OFF				⚙
8230	RS State					👁
8235	RS Result Frequency				Hz	👁
8236	RS Result SNR				dB	👁

P8201 Start RS

Starts the resonance search.

P8202 RS Start Source

Selects the input signal that starts the resonance search. The other start sources are not influenced by this parameter.

Value	Description
OFF	The resonance search is not started by an external signal.
IN1…8	The resonance search is started when the selected digital input changes from OFF to ON.
Logic Gate 1…3	The resonance search is started when the output of the selected logic module changes from OFF to ON.

P8230 RS State

Displays the state of the resonance search.

Value	Description
OFF	The resonance search is not active.
Search	The resonance search is active. Activating the enable signal is not possible.
OK	A resonance frequency was found and was copied to P7220 *Vibration Frequency*.
Fail	No resonance frequency was found (see P8235 and P8236).

P8235 RS Result Frequency

Displays the determined resonance frequency. The permissible range is 5Hz to 500Hz.

P8236 RS Result SNR

Displays the signal-to-noise ratio of the measurement in relation to the resonance frequency. The permissible minimum is 10dB.

7.14 Level Control

P...	Name	Factory Setting	Min	Max	Unit	Type
9001	LC Mode	OFF				⚙
9002	LC State					👁
9010	LC Sensor 1 Source	OFF				⚙
9011	LC Sensor 2 Source	OFF				⚙
9020	LC On Delay	1	0	100	s	⚙
9021	LC Off Delay	1	0	100	s	⚙
9030	LC Timeout Mode	OFF				⚙
9031	LC Timeout	10	0	1000	s	⚙

P9001 LC Mode

Activates the level control module.

Value	Description
OFF	The level control module is deactivated.
ON	The level control module is activated.

P9002 LC State

Displays the state of the level control module.

Value	Description
OFF	Material has been detected, the feeder is stopped.
On Delay	No material was detected, but the feeder remains stopped for the set delay time.
ON	No material was detected, the feeder is running.
Off Delay	Material has been detected, but the feeder continues to run for the set delay time.
Timeout	No material was detected for the set time limit, the feeder is stopped. The state is reset by toggling the enable signal.

P9010, P9011
LC Sensor 1…2 Source

Selects the inputs for the material sensors. Either one sensor or two sensors can be used. An unused sensor channel must be set to “OFF”.

Sensor Count	Behavior
1	The feeder starts when the sensor is OFF (no material detected). The feeder stops when the sensor is ON (material detected).
2	The feeder starts when sensor 2 is OFF (no material detected, buffer section empty). The feeder stops when both sensors are ON (material detected, buffer section full).

Value	Description
OFF	No sensor input is selected.
IN1…8	The selected digital input is used for a material sensor.
Logic Gate 1…3	The output of the selected logic module is used for a material sensor.

P9020 LC On Delay

Specifies how long no material may be continuously detected before the feeder is restarted.

P9021 LC Off Delay

Specifies how long material must be continuously detected before the feeder is stopped.

P9030 LC Timeout Mode

Specifies the behavior if no material has been detected for longer than the time set via P9031 *LC Timeout*.

Value	Description
OFF	Monitoring is not active.
Signal	If a timeout is detected, the timeout signal is activated. The signal is reset when material is detected again.
Signal + Stop	If a timeout is detected, the timeout signal is activated and the feeder is stopped. The feeder is restarted by toggling the enable signal.
Signal + Stop + Error	If a timeout is detected, the timeout signal is activated and the feeder is stopped. In addition, an error message is triggered.

P9031 LC Timeout

Specifies the timeout limit for the level control. If no material is detected for longer than this time, the feeder is stopped. The parameter has no function if P9030 *LC Timeout Mode* is set to “OFF”.

7.15 Sorting Air

P…	Name	Factory Setting	Min	Max	Unit	Type
9101	SA Mode	OFF				⚙
9102	SA State					👁
9110	SA Pre-Delay	1	0	10	s	⚙
9111	SA Post-Delay	1	0	10	s	⚙

P9101 SA Mode

Activates the sorting air module.

Value	Description
OFF	The sorting air module is deactivated.
ON	The sorting air module is activated.

P9102 SA State

Displays the state of the sorting air module.

Value	Description
OFF	Feeder and sorting air are not active.
Pre-Delay	Sorting air is active, feeder starts after the set pre-delay.
ON	Feeder and sorting air are active.
Post-Delay	Feeder is not active, sorting air stops after the set post-delay.

P9110 SA Pre-Delay

Specifies how long the sorting air should be activated before the feeder is started.

P9111 SA Post-Delay

Specifies how long the sorting air should remain activated after the feeder has been stopped.

7.16 Sorting Air with Sensor

P…	Name	Factory Setting	Min	Max	Unit	Type
9121	SAS Mode	OFF				⚙
9122	SAS State					👁
9130	SAS Ready Signal Source	OFF				⚙
9131	SAS Sensor Source	OFF				⚙
9140	SAS Delay	0	0	10	s	⚙
9141	SAS On Time	0.1	0	10	s	⚙

P9121 SAS Mode

Activates the sorting air module.

Value	Description
OFF	The sorting air module is deactivated.
ON	The sorting air module is activated.

P9122 SAS State

Displays the state of the sorting air module.

Value	Description
OFF	Sorting air is not active.
On Delay	Delay time is active, the sorting air is switched on after the set time has elapsed.
ON	Sorting air is active.

P9130 SAS Ready Signal Source

Selects the input for the sensor's ready signal. If the ready signal is OFF, the feeder is stopped so that no unsorted parts are transported. If no ready signal should be used, the selection must be set to “OFF”.

Value	Description
OFF	No ready signal is selected, the enable signal is not influenced.
IN1…8	The selected digital input is used as the ready signal.
Logic Gate 1…3	The output of the selected logic module is used as the ready signal.

P9131 SAS Sensor Source

Selects the input for the sensor signal. When the signal changes from OFF to ON, the timing sequence for the sorting air control is started.

Value	Description
OFF	No sensor signal is selected.
IN1…8	The selected digital input is used as the sensor signal.
Logic Gate 1…3	The output of the selected logic module is used as the sensor signal.

P9140 SAS Delay

Specifies the delay between the sensor signal and switching on the valve.

P9141 SAS On Time

Specifies how long the valve should be switched on.

7.17 Pulse Mode

P…	Name	Factory Setting	Min	Max	Unit	Type
9201	PM Mode	OFF				⚙
9210	PM On Time	1	0,1	10	s	⚙
9211	PM Off Time	1	0,1	10	s	⚙

P9201 PM Mode

Activates the pulse mode module.

Value	Description
OFF	The pulse mode module is deactivated.
ON	The pulse mode module is activated.

P9210 PM On Time

Sets the on time for the pulse mode.

P9211 PM Off Time

Sets the off time for the pulse mode.

7.18 Refill Feeder

P...	Name	Factory Setting	Min	Max	Unit	Type
9301	RFF Mode	OFF				⚙
9302	RFF State					👁
9310	RFF Sensor Source	OFF				⚙
9320	RFF On Delay	1	0	100	s	⚙
9321	RFF Off Delay	1	0	100	s	⚙
9330	RFF Timeout Mode	OFF				⚙
9331	RFF Timeout	10	0	1000	s	⚙

P9301 RFF Mode

Specifies the operating mode of the refill feeder module.

Value	Description
OFF	The refill feeder module is deactivated.
Standalone	The refill feeder module is activated and operates independent of the enable signal.
Linked to Enable Signal	The refill feeder module is activated and operates only when the enable signal is active.

P9302 RFF State

Displays the state of the refill feeder module.

Value	Description
OFF	Material has been detected, the refill feeder is stopped.
On Delay	No material was detected, but the refill feeder remains stopped for the set delay time.
ON	No material was detected, the refill feeder is running.
Off Delay	Material has been detected, but the refill feeder continues to run for the set delay time.
Timeout	No material was detected for the set time limit, the refill feeder is stopped. The state is reset by toggling the enable signal.

P9310 RFF Sensor Source

Selects the input for the material sensor. The refill feeder stops when the sensor is ON (material detected).

Value	Description
OFF	No sensor input is selected.
IN1…8	The selected digital input is used for the material sensor.
Logic Gate 1…3	The output of the selected logic module is used for the material sensor.

P9320 RFF On Delay

Specifies how long no material may be continuously detected before the refill feeder is restarted.

P9321 RFF Off Delay

Specifies how long material must be continuously detected before the refill feeder is stopped.

P9330 RFF Timeout Mode

Specifies the behavior if no material has been detected for longer than the time set via P9331 *RFF Timeout*.

Value	Description
OFF	Monitoring is not active.
Signal	If a timeout is detected, the timeout signal is activated. The signal is reset when material is detected again.
Signal + Stop	If a timeout is detected, the timeout signal is activated and the refill feeder is stopped. The refill feeder is restarted by toggling the enable signal.
Signal + Stop + Error	If a timeout is detected, the timeout signal is activated and the refill feeder is stopped. In addition, an error message is triggered.

P9331 RFF Timeout

Specifies the timeout limit for the level control. If no material is detected for longer than this time, the refill feeder is stopped. The parameter has no function if P9330 *RFF Timeout Mode* is set to “OFF”.

7.19 Pneumatic Step Conveyor

P…	Name	Factory Setting	Min	Max	Unit	Type
9401	PSC Mode	OFF				⚙
9402	PSC State					👁
9410	PSC Enable Source	RFF Enable				⚙
9420	PSC Sensor Top Source	OFF				⚙
9421	PSC Sensor Bottom Source	OFF				⚙
9430	PSC Top Delay	1	0	100	s	⚙
9431	PSC Bottom Delay	1	0	100	s	⚙

P9401 PSC Mode

Activates the pneumatic step conveyor module.

Value	Description
OFF	The pneumatic step conveyor module is deactivated.
ON	The pneumatic step conveyor module is activated.

P9402 PSC State

Displays the state of the pneumatic step conveyor module.

Value	Description
OFF	The module is deactivated.
Upwards	Solenoid valve is on, controller is waiting for signal from upper sensor.
Top Delay	Solenoid valve is on, cylinder is up, controller waits for the set delay time.
Downwards	Solenoid valve is off, controller is waiting for signal from lower sensor.
Bottom Delay	Solenoid valve is off, cylinder is down, controller waits for the set delay time.

P9410 PSC Enable Source

Selects the enable signal for the pneumatic step conveyor.

Value	Description
RFF Enable	The step conveyor is controlled by the *Refill Feeder* module.
IN1…8	The selected digital input is used as the enable signal.
Logic Gate 1…3	The output of the selected logic module is used as the enable signal.

P9420, P9421
PSC Sensor Top/Bottom Source

Selects the source for the upper and lower cylinder sensor. The controller can also be operated without sensors.

Value	Description
OFF	No input is selected. The controller does not wait until the cylinder has reached the respective end position. Instead, the delay time starts immediately when the solenoid valve is toggled.
IN1…8	The selected digital input is used for the respective sensor. The controller waits until the cylinder has reached the respective end position before the delay time starts.
Logic Gate 1…3	As IN1...8, but output from selected logic module.

P9430, P9431
PSC Top/Bottom Delay

Specifies the delay times. With a sensor, the delay time starts when the end position is reached; without a sensor, the delay time starts when the solenoid valve is toggled.

7.20 Signal Lights

P…	Name	Factory Setting	Min	Max	Unit	Type
9510	SL1 Source Static	OFF				⚙
9511	SL1 Source Flashing	OFF				⚙
9512	SL1 Source Priority	Flashing				⚙
9513	SL1 Flashing Interval	1	0,1	10	s	⚙
9514	SL1 Flashing Duty Cycle	50	10	90	%	⚙
9520	SL2 Source Static	OFF				⚙
9521	SL2 Source Flashing	OFF				⚙
9522	SL2 Source Priority	Flashing				⚙
9523	SL2 Flashing Interval	1	0,1	10	s	⚙
9524	SL2 Flashing Duty Cycle	50	10	90	%	⚙
9530	SL3 Source Static	OFF				⚙
9531	SL3 Source Flashing	OFF				⚙
9532	SL3 Source Priority	Flashing				⚙
9533	SL3 Flashing Interval	1	0,1	10	s	⚙
9534	SL3 Flashing Duty Cycle	50	10	90	%	⚙

P9510, P9511, P9520, P9521, P9530, P9531
SL1…3 Source Static/Flashing

Selects the sources for the input signals.

Value	Description
OFF	The input is permanently OFF.
ON	The input is permanently ON.
IN1…8	The selected digital input is used as an input.
Logic Gate 1…3	The output of the selected logic module is used as an input.
Ready	The input is ON when P0070 *Status* is “Ready”.
Ready or Enable Signal on	The input is ON when P0070 *Status* is “Ready” or “Enable Signal on”.
Enable Before Control Modules	P7040 *Enable Before Control Modules* is used as an input.
Enable After Control Modules	P7050 *Enable After Control Modules* is used as an input.
SVO active	The input is ON when the SVO function is active.
Warning	The input is ON when a warning message is active.
Error	The input is ON when an error message is active.
Voltage Limit	The input is ON when the voltage limit is active.
Current Limit	The input is ON when the current limit is active.
LC Timeout	The timeout output of the level control module is used as an input.
RFF Timeout	The timeout output of the refill feeder module is used as an input.

P9512, P9522, P9532
SL1…3 Source Priority

Specifies which of the two inputs has priority for controlling the signal light.

Value	Description
Static	When both inputs are ON, the signal light lights up continuously.
Flashing	When both inputs are ON, the signal light flashes.

P9513, P9523, P9533
SL1…3 Flashing Interval

Sets the flashing interval.

P9514, P9524, P9534
SL1…3 Flashing Duty Cycle

Sets the duty cycle of the flashing signal.

7.21 Fieldbus

These parameters are described in the corresponding fieldbus documentation.

7.22 Operating Time

P…	Name	Factory Setting	Min	Max	Unit	Type
D001	Operating Time Total				h:mm:ss	👁
D002	Operating Time Enabled				h:mm:ss	👁
D010	Operating Time <40°C				h:mm:ss	👁
D011	Operating Time 40...50°C				h:mm:ss	👁
D012	Operating Time 50...60°C				h:mm:ss	👁
D013	Operating Time 60...70°C				h:mm:ss	👁
D014	Operating Time 70...80°C				h:mm:ss	👁
D015	Operating Time >80°C				h:mm:ss	👁

PD001 Operating Time Total

Displays the total operating time.

PD002 Operating Time Enabled

Displays the operating time of the output stage.

PD010, PD011, PD012, PD013, PD014, PD015
Operating Time …°C

Displays the operating time at the respective output stage temperature.

7.23 Error

P…	Name	Factory Setting	Min	Max	Unit	Type
E001	Error Reset Source	OFF				⚙
E010	Reset Error					⚙
E110	Error Memory 1					👁
E120	Error Memory 2					👁
E130	Error Memory 3					👁
E140	Error Memory 4					👁
E150	Error Memory 5					👁
E111	Error Time 1				h:mm:ss	👁
E121	Error Time 2				h:mm:ss	👁
E131	Error Time 3				h:mm:ss	👁
E141	Error Time 4				h:mm:ss	👁
E151	Error Time 5				h:mm:ss	👁

PE001 Error Reset Source

Selects the source for the error reset. An active message (P0080 *Message 1*) is reset by a positive signal edge if a reset is possible.

Value	Description
OFF	No source is selected. Errors can only be reset via the display or PE010.
IN1…8	Errors are reset when the selected digital input changes from OFF to ON.
Logic Gate 1…3	Errors are reset when the output of the selected logic module changes from OFF to ON.

PE010 Reset Error

Resets an active message (P0080 *Message 1*) if a reset is possible.

PE110, PE120, PE130, PE140, PE150
Error Memory 1…5

Displays the last 5 errors. The most recent error is always displayed on PE110 *Error Memory 1*.

PE111, PE121, PE131, PE141, PE151
Error Time 1…5

Shows the time (PD001 *Operating Time Total*) when the respective error occurred.

7.24 Memory

P…	Name	Factory Setting	Min	Max	Unit	Type
F100	Load Factory Settings	Not activated				⚙

F100 Load Factory Settings

If this parameter is activated, the factory settings are loaded the next time the device is restarted. This cannot be undone.

The following parameters are not reset:
P0040 *Comment*
P0060 *Language*

8 Controller Tuning

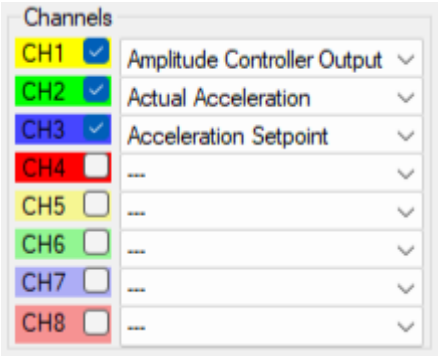
8.1 Amplitude Controller

The following requirements must be met for tuning the amplitude controller:

- The feeder must be empty (lowest damping corresponds to the worst case scenario for the control loop; if the controller is tuned with a dampened feeder, the control loop might become unstable when the conveyed material is missing).
- P8001 *AFC Mode* must be set to “Amplitude”.
- P7140 *Start Ramp* must be set to 100ms.
- P8032 *Open-Loop Start* must be deactivated.
- The acceleration sensor must be configured.
- The setpoint must be set to the desired operating point.
- The vibration frequency must be set to the desired operating point (without frequency control: frequency with a suitable distance from the resonance frequency; with frequency control: frequency as close as possible to the resonance frequency).

Oscilloscope

The scope function in MEDI is used for tuning. The following channels should be selected for this purpose:



The following scope settings are recommended (depending in part on the feeder):

Mode = ROLL
Horizontal = 1 s/div
Vertical CH1 = 50 %/div
Vertical CH2 = 5 g/div
Vertical CH3 = 5 g/div

General

The controller parameters P8030, P8031 and P8034 (P, I and D term) are set by evaluating the step response. A step response is generated by activating the enable signal for a few seconds with the preset setpoint and recording the behavior of the control loop. The exact curve shapes and scales depend on the respective feeder. In the examples in the following sections, only the general shape is relevant.

Tuning can be done either by adjusting the default values or by determining the values from scratch. The latter method is recommended if the control loop is unstable with the default values. Both methods have the same goal – a step response should be achieved in which the actual value reaches the setpoint within a reasonable time but does not overshoot. In addition, the amplitude controller output should not overshoot either.

Since practically all feeders exhibit an amplitude-dependent shift of the resonance frequency, they represent a non-linear system. Changes in the ratio of the drive frequency to the resonance frequency can also significantly alter the behavior of the system. Therefore, the control loop should not be optimized for maximum possible control speed. For applications requiring a fast start-up, P8032 *Open-Loop Start* can be activated after the controller has been tuned.

When doing a coarse adjustment of the P, I and D terms, steps should be used that correspond approximately to a factor of 2, e.g. 1 → 2 → 5 → 10. This makes the influence of the respective value immediately apparent.

Use of the D term

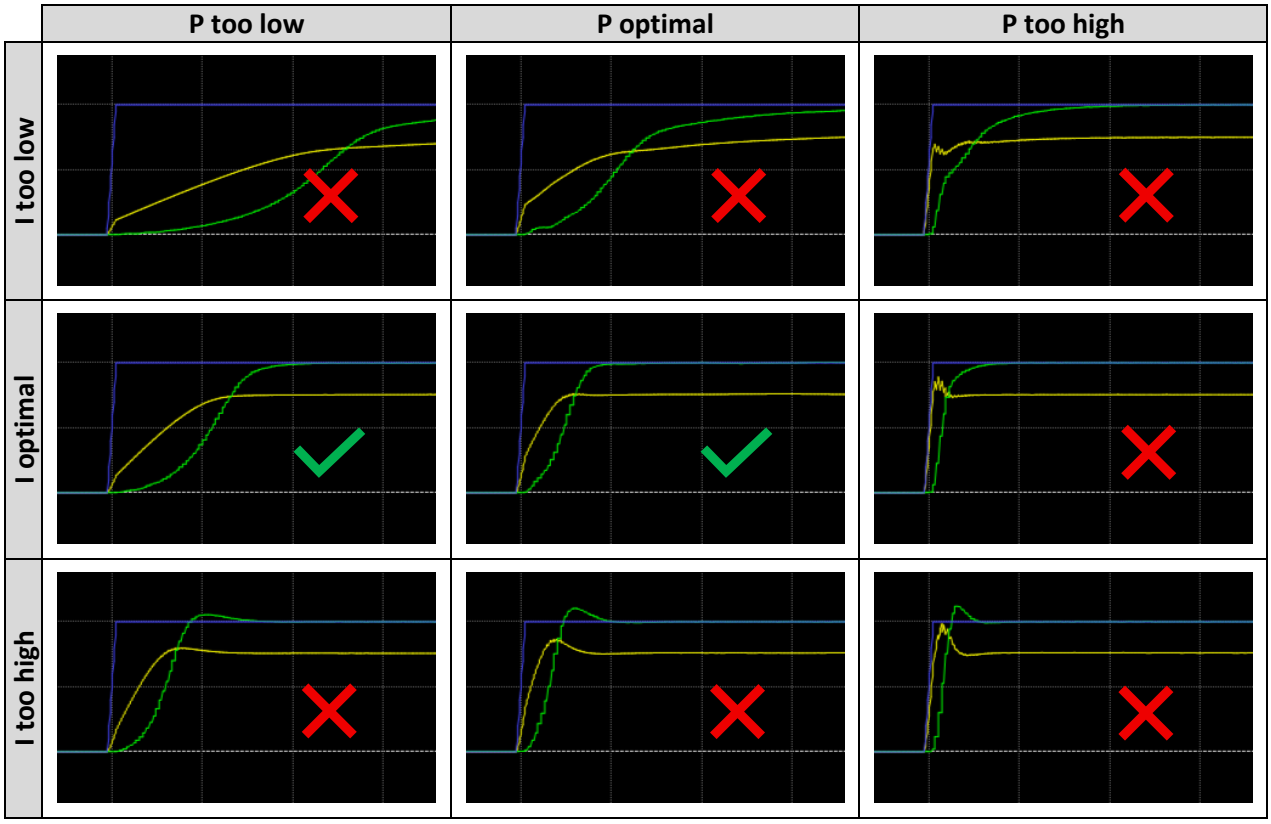
The amplitude controller also has a D term. This should only be used when necessary. Otherwise, this value should always be left at zero.

Case A:
The amplitude-dependent resonance shift, together with very low damping, leads to unfavorable behavior at the desired operating point. In this case, the feeder is inherently unstable even at constant voltage and constant frequency. This behavior can be compensated for by the D term. Start with the default values for P and I and increase D until stable behavior is achieved. P and I can then be further optimized.

Case B:
The feeder is subject to strong and rapid load changes and cannot compensate quickly enough with P and I terms alone. Once P and I have been optimized, D can be increased until the control characteristics meet the requirements.

Tuning by modifying the default values

The following examples can be used to determine whether the values for P and I are too low or too high.

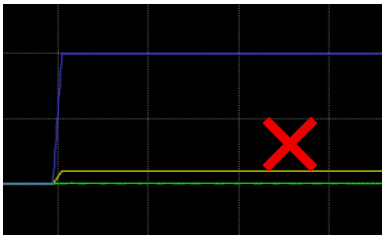
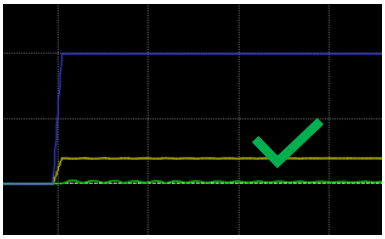
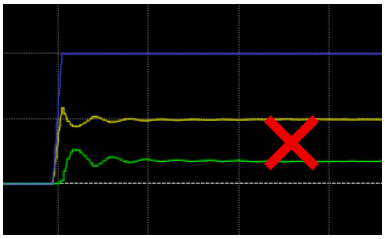


Blue: Setpoint
Green: Actual value
Yellow: Controller output

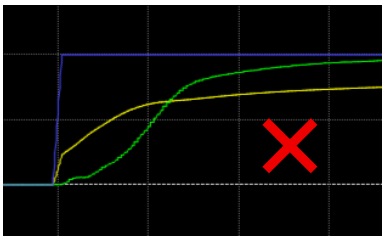
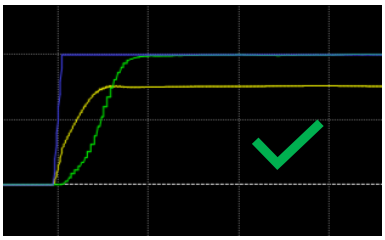
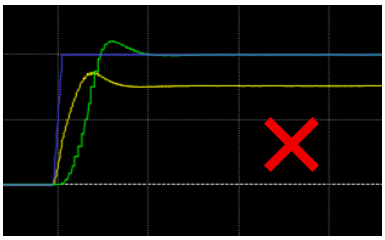
- If P is too low, the response is generally slow.
- If P is too high, the controller output overshoots and has an erratic response.
- If I is too low, the actual value approaches the setpoint only slowly.
- If I is too high, overshoot of the actual value and the controller output occurs.
- If P and I are set optimally, the actual value approaches the setpoint relatively quickly without overshooting.
- If P or I are far too high, continuous oscillation of the controller output and the actual value occurs.

Tuning from scratch

To do this, first set P and I to zero. Then increase P until there is no significant oscillation of the controller output (yellow). The actual value (green) normally remains well below the setpoint (blue) due to the lack of the I term.

P too low	P optimal	P too high
		

In the next step, I is increased until the actual value approaches the setpoint relatively quickly without overshooting.

I too low	I optimal	I too high
		

8.2 Frequency Controller

The following requirements must be met for tuning the frequency controller:

- The feeder must be empty (lowest damping corresponds to the worst case scenario for the control loop; if the controller is tuned with a dampened feeder, the control loop might become unstable when the conveyed material is missing).
- The acceleration sensor and amplitude controller must be set up correctly so that the amplitude control works.
- P8001 *AFC Mode* must be set to “Amplitude + Frequency”.
- The setpoint must be set to the desired operating point.

As with the amplitude controller, the scope function in MEDI is required for tuning (see chapter 8.1). The controller parameters P8050 and P8051 (t and w) are adjusted by monitoring the actual value relative to the setpoint, as well as P7220 *Vibration Frequency*. In contrast to the amplitude controller, the values are observed during continuous operation.

The frequency controller adjusts the frequency cyclically by one step w in the time grid t. This is visible in the oscilloscope as a slight short-term deviation of the actual value from the setpoint. If not, w must be increased until this becomes visible. For t, enter at least twice the time required by the amplitude controller to completely compensate for the deviation caused by the frequency steps.

w is then set so that the vibration frequency always moves up and down by approx. 3...5 steps. For feeders with very pronounced resonance, it may be necessary to set w very low and the display resolution of the vibration frequency may no longer be sufficient to see these frequency steps. In this case, as with the tuning of t, the cyclic deviation of the actual value is observed and w is reduced until the deviations are still measurable but do not affect the behavior of the feeder.

- If t is too small, the vibration frequency slowly moves away from the resonance frequency.
- If t is too high, the frequency controller reacts very slowly but remains stable.

- If w is too low, the vibration frequency slowly moves away from the resonance frequency and randomly reverses direction.
- If w is too high, significant deviations from the actual value occur cyclically in the time grid t.

9 Error and Warning Messages

9.1 General

Messages are displayed via P0080 through P0082. The messages are displayed in chronological order, with P0080 always showing the first or oldest message. Message reset always takes effect on P0080. If multiple messages are active at the same time, they shift from P0081 and P0082 to P0080.

Property abbreviations used in the following chapters:

Property	Description
E	Message reports an error. The output stage is turned off immediately.
W	Message reports a warning. The message has no direct effect on the operation of the device.
R	Message can be reset manually via PE0001/PE010 when its condition is resolved.
S	Message requires a restart of the device.
A3	Message is cleared automatically 3 seconds after its condition is resolved.
M	Message is stored in error memory.

9.2 Messages 1XX

Code	Properties	Description	Primary Cause
100	E S M	Internal error	Internal error
110	E S M	Internal error	Internal error
120	E S M	Internal error	Internal error
121	E S M	Internal error	Internal error
122	E S M	Internal error	Internal error
123	E S M	Internal error	Internal error
124	W S	Internal warning	Command via interface

9.3 Messages 2XX

Code	Properties	Description	Primary Cause
200	E R M	Internal error	Internal error
201	E R M	Writing parameter: Parameter is read-only	Internal error or interface
202	E R M	Checking parameter value: U32 value too high	Internal error, interface or invalid value in NVM
203	E R M	Checking parameter value: U32 value too low	Internal error, interface or invalid value in NVM
204	E R M	Checking parameter value: I32 value too high	Internal error, interface or invalid value in NVM
205	E R M	Checking parameter value: I32 value too low	Internal error, interface or invalid value in NVM
206	E R M	Checking parameter value: F32 value too high	Internal error, interface or invalid value in NVM
207	E R M	Checking parameter value: F32 value too low	Internal error, interface or invalid value in NVM
208	E R M	Checking parameter value: Invalid BOOL value	Internal error, interface or invalid value in NVM
209	E R M	Checking parameter value: Invalid ENUM value	Internal error, interface or invalid value in NVM

9.4 Messages 3XX

Code	Properties	Description	Primary Cause
300	E S M	Current offset out of tolerance	Internal error
301	E R A3	SW Options invalid	Internal error
302	E S M	Output stage undertemperature	Internal error, device below −20°C

9.5 Messages 4XX

Code	Properties	Description	Primary Cause
400	E S M	SVO signal error	SVO signals are different for >2s
401	E S M	Output stage overtemperature	Insufficient heat dissipation, output stage over 85°C
402	E S M	Output stage overcurrent	Short circuit on magnet output
403	E R A3	Undervoltage	Mains voltage is switched of or too low
404	E R M	Overvoltage	Mains voltage is too high
405	E R M	OUT1…4 driver error	Short circuit or overload on OUT1…4
406	E R M	+24V supply error	Supply voltage tool low or overloaded
407	E R M	Acceleration sensor offset error	DC offset of the acceleration sensor is not within the set limits
408	E R A3	Acceleration sensor setting error	Acceleration sensor input is not configured correctly (input mode or sensor source)
409	E R A3	Synchronization input setting error	Synchronization input is not configured correctly (input mode)
410	E R M	Magnet overtemperature	Temperature switch of the magnet has tripped

9.6 Messages 5XX

Code	Properties	Description	Primary Cause
500	E R A3	Resonance search error	No resonance frequency found, feeder is dampened too much or sensor is not connected to the feeder
501	E R M	Minimum frequency error	Mechanical defect on feeder
502	E R M	Maximum frequency error	Mechanical defect on feeder
503	E R M	Voltage limit	Voltage limiter active and error enabled
504	E R M	Current limit	Current limiter active and error enabled
505	E R M	Level control timeout	No material detected by the level control module for a given time
506	E R M	Refill feeder timeout	No material detected by the refill feeder module for a given time
507	E R M	Fieldbus error	Fieldbus module detected an error

9.7 Messages 6XX

Code	Properties	Description	Primary Cause
600	W R A3	Warning OFF/ON button	OFF/ON button pressed, but not configured as enable source
601	W R A3	Warning AFC/RS activation	Module A/F Controller or Resonance Search is enabled but not activated
602	W R A3	Warning SYNC activation	Module Synchronization is enabled but not activated
603	W R A3	Warning LC activation	Module Level Control is enabled but not activated
604	W R A3	Warning SA activation	Module Sorting Air is enabled but not activated
605	W R A3	Warning PM activation	Module Pulse Mode is enabled but not activated
606	W R A3	Warning RFF activation	Module Refill Feeder is enabled but not activated
607	W R A3	Warning PSC activation	Module Pneumatic Step Conveyor is enabled but not activated
608	W R A3	Warning Temperature	Insufficient heat dissipation, output stage over 70°C

10 Service

10.1 Maintenance

The device is maintenance-free.

10.2 Cleaning

ATTENTION!

Damage to the device due to unsuitable cleaning agents!

Parts of the surface of the device can be damaged by solvents or aggressive cleaning agents.

10.3 Long-Term Storage

For long-term storage, the device must be connected to mains voltage for at least 10 minutes once a year (with the main switch switched on, if available). Otherwise the device may be destroyed.

After storage without power for more than two years, the mains voltage must be increased gradually according to the following procedure before commissioning. This can be done, for example, using a variable transformer:

1. 100V for 15 minutes
2. 150V for 15 minutes
3. 200V for 15 minutes
4. 240V for 1 hour

10.4 Disposal

Please follow the current national regulations for the disposal of electronic devices.

11 Revision History

Date	Changes
2025-04-15	Initial version
2025-07-22	Updated for revised enable module (FW00122 V01.18)
2025-08-05	Added signal lights module
2025-09-09	Corrected table in chapter 3.2
2025-11-17	Added MODBUS RTU
2025-12-11	Added chapter 5.4
2026-02-02	Modifications for FW00122 V01.23, corrected errors, added chapter 3.13
2026-02-25	Added P8034 in chapter 6.8 and 7.12, modified ranges of P8050 and P8051, removed P8210, P8220 and P8221 (modifications for FW00122 V01.25) Updated scope of delivery, added chapter 8
2026-03-09	Added messages 302 and 608, adjusted limits of P7140 and P7141 (modifications for FW00122 V01.27), added chapter 3.7
2026-03-17	Added P3011, added section “Info Symbols” in chapter 5.5 (modifications for FW00122 V01.28)
2023-03-31	Supplemented chapter 5.5 for FW00122 V01.29, revised chapter 7
2026-04-10	Updated chapters 5.5, 6.1, 7.1, 7.2, 7.4, 7.5, 7.6, 7.20, 7.23 and 9.1, added chapters 6.11 and 7.16, renamed P7001, P7040 and P7050 (modifications for FW00122 V01.31) Modified chapter 3.4, added chapter 3.5
2026-06-08	Removed P3020, modified P6011 (modification for FW00122 V01.32) Correction in chapter 7.2
2026-07-22	Updated P3011 and P8032, added P8033, renamed STO to SVO (modifications for FW00122 V01.33) Updated chapter 3.2, 3.4 and 10.3, added chapter 3.9, 3.10 and 3.11

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