

# **BERGES**

## **Operating Instructions** **Crane Control Option ACP 6000** **(as from software version 2.7)**



**ACP** <sup>SLV</sup>  
**6000**

# 1 Description of the Crane Control Option ACP 6000 (as from software version 2.7)

The BERGES crane control option has been developed specifically for crane and trolley travel applications.

The extensive crane control function includes working limit settings for the maximum and minimum speeds as well as switching inputs for speed limitation in the limit switch or safety limit switch area.

Two inverters are required for complete 2-axis control (crane and trolley travel), one for each axis.

The parameter **81-PRGNO** (selection of special programs) permits the control terminals of the ACP inverters to be switched from the standard function to the BERGES crane control option. This is done by entering the number **430** in the parameter **81-PRGNO**.

The following types of contact are used for controlling the individual control inputs:

- FWD = NO contact
- REV = NO contact
- R/J = NO contact
- PS1 = NC contact
- PS2 = NC contact
- PS3 = NC contact
- ART = NC contact

## 1.1 Safety Measures

- 1) The frequency converter-operated lifting motor is monitored as far as possible by the frequency converter. To prevent damage in the event of a fault occurring, an additional safety switch is required for the brake control.

**EXAMPLE:**

The maximum frequency (parameter 23) has been programmed from 50 Hz to 100 Hz or higher and the motor loses the torque in the weakening of the field; due to this, the load can pass through. The damage occurring as a result can be prevented by additional monitoring.

**HINT!**

- 2) The network downtime of the frequency converter must be maintained until the terminal “+24V” has attained 0 volt or the display of the converter has turned dark. The Inverter protects itself from switching on frequently and turning off and is then operational again after approx. 10 minutes.

## 1.2 Functional Description

**FWD** = Selection of direction of rotation clockwise.  
Save speed.

**Parameter selection: 31-FMIN**

When this input is selected for the first time, the drive accelerates to the target frequency entered in the parameter **31-FMIN**. Operation is continued with the just reached rotational frequency during the acceleration and deceleration phases by activation of this input.

Only the limit switch speeds entered in parameters **34-F3** (inputs PS1 and PS2) and **33-F2** (input PS3) may lie below this speed in travelling operation. Simultaneous operation of the control inputs FWD and REV means stop.

**REV** = Selection of direction of rotation counter-clockwise.  
Save speed.

**Parameter selection: 31-FMIN**

When this input is selected for the first time, the drive accelerates to the target frequency entered in the parameter **31-FMIN**. Operation is continued with the just reached rotational frequency during the acceleration and deceleration phases by activation of this input.

Only the limit switch speeds entered in parameters **34-F3** (inputs PS1 and PS2) and **33-F2** (input PS3) may lie below this speed in travelling operation. Simultaneous operation of the control inputs FWD and REV means stop.

**R/J** = Acceleration.

**Parameter selection: 32-FMAX**

The drive is accelerated from the just reached frequency if this input is selected together with an FWD or REV input. If only the R/J input is activated, the drive is decelerated to zero speed using the entered deceleration time function.

The value defined in the parameter **32-FMAX** can be approached directly as the maximum frequency.

This maximum frequency is overwritten if the inputs PS1 (parameter **34-F3**) or PS2 (parameter **34-F3**) or PS3 (parameter **33-F2**) or ART (parameter **35-F4**) are not activated.

The frequency entry in the parameter **32-FMAX** is also the upper limit of the input range of parameters 31 to 36.

**PS1** = Limit switch S1 (forward).

**Parameter selection: 34-F3**

The input PS1 is de-energized if the crane travels over this limit switch with the direction of rotation "forward". The drive is decelerated to the frequency entered here by way of the deceleration ramp if the instantaneous frequency of the drive is greater than that defined in parameter **34-F3**.

This limit switch does not produce any frequency or functional change if the instantaneous frequency is less than that in parameter **34-F3**. If the crane is in the area between limit switches S1 and S3/S4 and the direction of rotation "reverse" is selected, then the frequency limit is deactivated for this direction of rotation.

**PS2** = Limit switch S2 (back).

**Parameter selection: 34-F3**

The input PS2 is de-energized if the crane travels over this limit switch with the direction of rotation "forward". The drive is decelerated to the frequency entered here by way of the deceleration ramp if the instantaneous frequency of the drive is greater than that defined in parameter **34-F3**.

This limit switch does not produce any frequency or functional change if the instantaneous frequency is less than that in parameter **34-F3**. If the crane is in the area between limit switches S1 and S3/S4 and the direction of rotation "forward" is selected, then the frequency limit is deactivated for this direction of rotation.

**PS3** = Limit switches S3 and S4 (safety range).

**Parameter selection: 33-F2**

The input PS3 is de-energized if the crane travels over this limit switch, irrespective of the direction of rotation. The drive is decelerated to the frequency entered here by way of the deceleration ramp if the instantaneous frequency is greater than that defined in parameter **33-F2**. This limit switch does not produce any frequency or functional change if the instantaneous frequency is less than that defined in parameter **34-F3**. This frequency limit is valid for both directions of rotation. In practice, the limit switches at the craneway ends are connected jointly to the input PS3 by means of a wired-AND connection.

**ART** = Switchover between cab (radio) - floor control (switch S5).

**Parameter selection: 35-F4**

When this input is in de-energized condition, the frequency defined in parameter **32-FMAX** is reduced to the value entered in parameter **35-F4**. The drive is decelerated to this frequency by way of the deceleration ramp if the instantaneous frequency is greater than that defined in parameter **35-F4**. The frequency limits defined in the parameters 31 to 35 are limited by the value entered here if the setpoint limit **35-F4** is active.

**MOL** = Motor protective relay input.  
Overtemperature protection, braking resistor.

If a motor protective relay or external braking resistor is used, the MOL input must be connected via the NC contact of the motor protective relay or the temperature clixon of the external braking resistor. Any interruption of the circuit results in the inverter being disabled immediately and the drive then coasts to a stop.

The **error F07** is shown on the display of the inverter. An error reset can be carried out by switching off the mains power and then switching back on again or by pressing the STOP key on the inverter or by connecting the error reset input RST at the inverter.

A wire jumper is fitted between MOL and +24 V at the works.

**ST1** = Holding brake operation.  
**Parameter selection: 72-ST1 (function 3, motor runs in counter-clockwise or clockwise direction).**

This parameter activates the open collector output ST1; the function 3 should be entered here (motor runs in counter-clockwise or clockwise direction).

The control output ST1 is connected after a start command in counter-clockwise or clockwise direction. A relay (maximum coil current 50 mA) connected here is then energized and a mechanical holding brake can be operated by way of the relay contacts.

In the event of a fault or drive standstill, the transistor disables the output ST1 and the connected relay drops out; the holding brake is then activated.

### Acceleration and deceleration times

The acceleration and deceleration times are entered in the parameters **42-ACC1** and **43-DEC1**. In addition, it is recommended to select the function 3 (S-shaped acceleration/ deceleration ramp) in the parameter **41-RSEL** (ramp selector).

Parameter	Description	Works setting
<b>21-MODE</b>	The various combinations of the active control source can be selected with this parameter.	14
<b>31-FMIN</b>	Defines the minimum speed.	10 Hz
<b>32-FMAX</b>	Defines the maximum speed.	50 Hz
<b>33-F2</b>	Defines the travel speed in the safety range.	3 Hz
<b>34-F3</b>	Defines the travel speed in the limit switch range.	5 Hz
<b>35-F4</b>	This parameter allows programming of a second maximum travel speed which can be activated via the control terminal ART.	45 Hz
<b>42-ACC1</b>	Acceleration time in seconds referred to the maximum travel speed ( <b>32-FMAX</b> ).	5 s
<b>43-DEC1</b>	Deceleration time in seconds referred to the maximum travel speed ( <b>32-FMAX</b> ).	5 s
<b>72-STR1</b>	This parameter defines the function of the open collector output on the control board.	3
<b>75-STR</b>	This parameter defines the function of the auxiliary relay output on the control board.	1
<b>81-PRGNO</b>	This parameter activates the BERGES crane control option.	430

## 1.3 Switching Matrix

Input terminals							Function
FWD	REV	R/J	ART	PS1	PS2	PS3	
0	0	X					Stop
1	1	X					Stop
1	0	0					Start forward/maintain speed
1	0	1					Acceleration forward
0	1	0					Start reverse/maintain speed
0	1	1					Acceleration reverse
1	0	1	1	X	1	1	Speed limit 1 forward (FMAX)
1	0	X	0	X	1	1	Speed limit 2 forward (F4)
1	0	X	X	X	0	1	Limit switch speed forward S2 (F3)
1	0	X	X	X	X	0	Safety limit switches S31 and S32 (F2)
0	1	X	1	1	X	1	Speed limit 1 reverse (FMAX)
0	1	X	0	1	X	1	Speed limit 2 reverse (F4)
0	1	X	X	0	X	1	Limit switch speed reverse S2 (F3)
0	1	X	X	X	X	0	Safety limit switches S31 and S32 (F2)

**NOTES:**

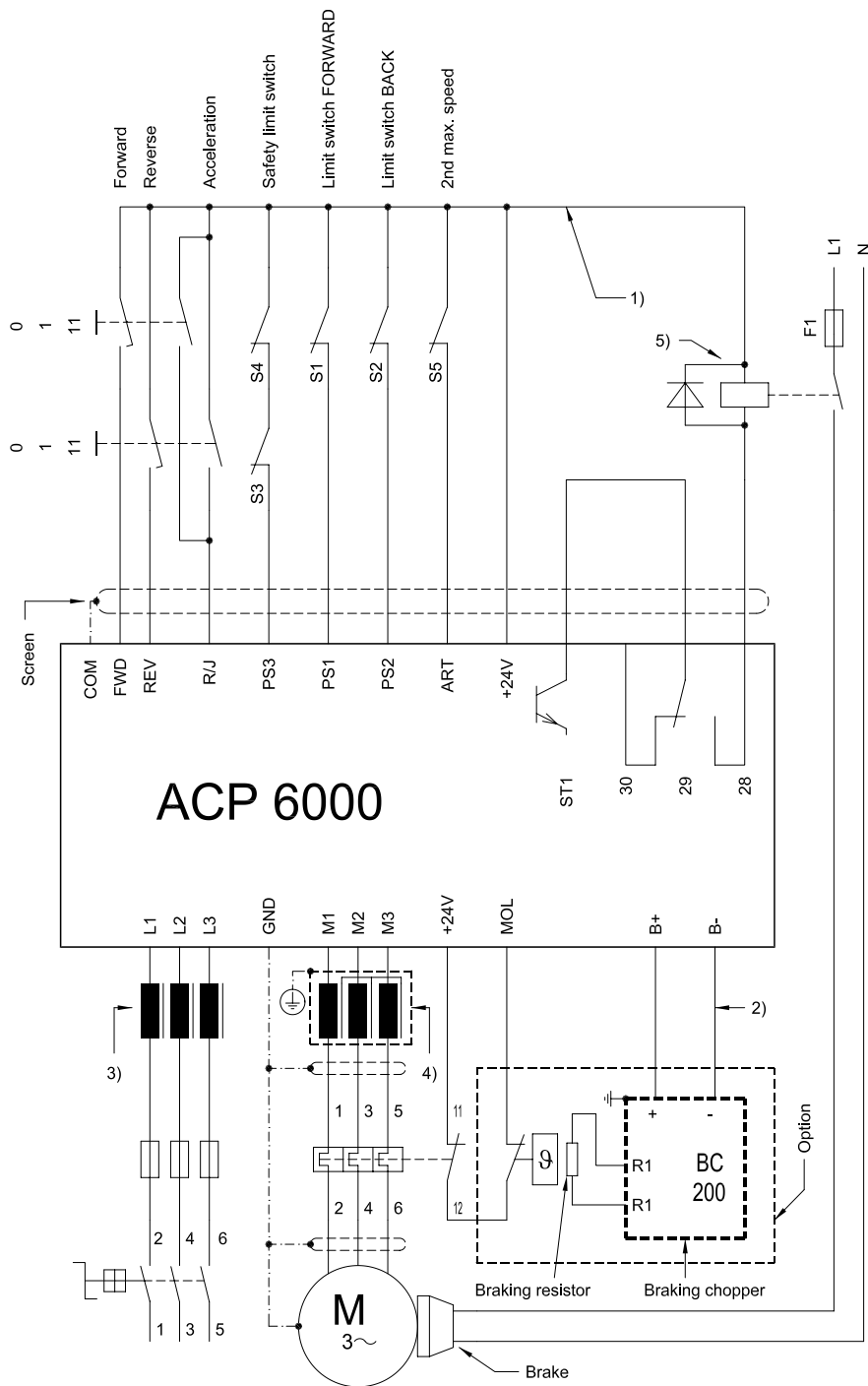
0 = inactive

1 = active

X = not significant

FMAX, F2, F3, F4 = inverter parameters

1.4 Connection Diagram



**NOTES:**

- 1) Maximum cable length 5 m (screened). Decoupling relays must be used for longer cables.
- 2) Maximum cable length between inverter and braking chopper 2 m (twisted).
- 3) Mains filter option.
- 4) Output reactor option.
- 5) Maximum coil current 50 mA (24 V DC). Connect coil with free-wheeling diode.





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