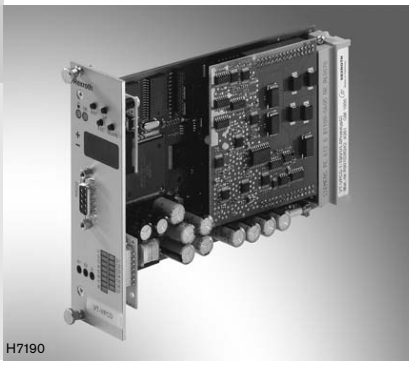
Digital positioning card for position-dependent braking

RE 30144/09.04 1/8
Replaces: 06.03

Type HACD-B

Component series 1X



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Features

- Position-dependent braking of a hydraulic axis
- Preselection of the target position possible via analogue input or internal parameter
- Preselection of traversing speed possible via analogue input or internal parameter
- Actual value acquisition possible by means of SSI encoder or analogue position measuring system
- Adjustable start-up ramp with rounding option (S-components)
- Adjustable emergency ramp for stopping a movement
- Braking characteristics can be set to linear or root-shaped
- Residual speed logic with shutdown in the target window or permanent activation for traversing to the mechanical limit stop
- Overlap compensation for valves with positive overlap
- Traversing profile can be adjusted separately for A->B and B->A
- Set-up operating mode with separate preselection of traversing speed and residual speed
- Start A->B or B->A via digital input
- Activation of set-up mode via digital input
- Switching outputs for “position A and B reached”
- Enable input and OK output
- ±10 V reference voltage output
- Front display with keys for displaying and changing parameters as well as for diagnosis purposes
- RS232 serial interface

Accessories required:

- PC program BODAC: Ordering code of the CD: SYS–HACD–BODAC–01 (mat. no. R900777335) or download on the Internet at: www.boschrexroth.com/hacd
- Interface cable: Cable set VT–HACD–1X/03.0/HACD-PC (mat. no. R900776897) or commercial 1:1 cable

Further information:

- Installation instructions for HACD-B, see RE 30144-B
- Operating instructions for BODAC and commissioning instructions for HACD included in the BODAC program package, see RE 30144-01-B

Suitable card holders

- 19“ rack types VT 19101, VT 19102, VT 19103 and VT 19110 (see RE 29768)
- Enclosed card holder type VT 12302 (see RE 30103)
- Open card holder type VT 3002-2X/64G (see RE 29928) Only for installation in a control cabinet!
- Connection adapter type VT 10812-2X/64G (see RE 30105)

Suitable power supply unit

- Compact power supply unit type VT-NE30 (see RE 29929)

Ordering code

VT–HACD–B – 1 –1X/V0/ 1 – 0 – 0

Digital controller card		
Component series 10 to 19 (10 to 19: unchanged installation and connection dimensions)	**= 1X**	
Basic unit	**= V0**	
	1 =	With display
	0 =	Without bus interfacing
	0 =	Without valve output stage

Functional description

The HACD-B digital positioning card for position-dependent braking is designed as double-sided printed circuit board in Euro-format 100 x 160 mm.

A microcontroller controls the entire sequence. Card-specific data (configuration and parameters) are saved in a non-volatile memory.

The card is completely configured by means of software and does not include any jumpers or similar items. For the purpose of configuration, the HACD-B must be connected to a PC via a serial interface (RS 232, 1:1 cable). The configuration as well as parameterisation and diagnosis are carried out by means of the BODAC user interface.

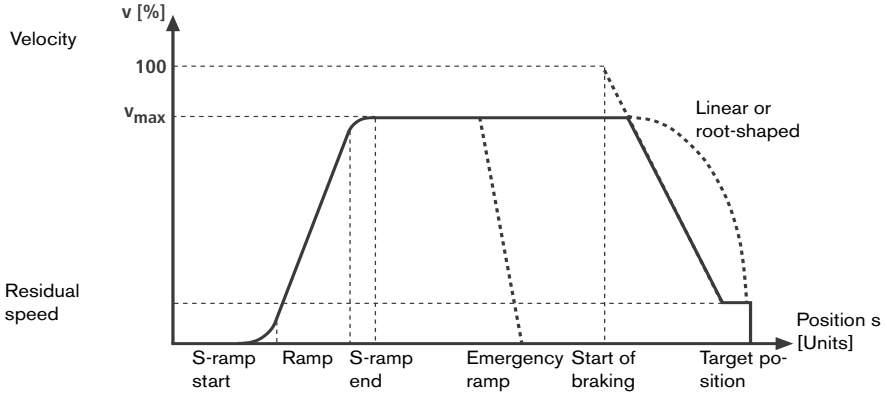
Alternatively, parameterisation and diagnosis can also be carried out with the help of the 4 keys and the display on the front panel.

The parameters for target position, traversing speed, braking and residual speed can be selected separately for the directions A->B and B->A.

Functional description (continuation)

The movements A->B or B->A are started via switching inputs.

The switching inputs signal that target position A or B has been reached within an adjustable target window.



Target position

The target position can be fed forward either via the analogue input or set by means of internal parameters.

Traversing speed

The traversing speed, too, can be fed forward via the analogue input or by means of internal parameters. A downstream ramp generator with rounding option for the start and end of the ramp allows jerk-free acceleration of the drive. An adjustable emergency ramp allows smooth stopping of the drive when the start signal is withdrawn.

Braking

The time of braking is to be given as internal parameter. It is to be entered as distance to the target position referred to a speed of 100%. The braking characteristics can be linear or root-shaped.

Residual speed

The residual speed logic allows both, traversing at creep speed to the target position or traversing to the mechanical limit stop. When traversing to the target position was selected, the residual speed is switched off within an adjustable target window. When traversing to limit stop was selected, the active residual speed is maintained.

Moreover, it is possible to compensate for the characteristics of valves with positive overlap with the help of the overlap compensation feature.

Set-up operating mode

The set-up mode can be activated using the “set-up” switching input.

In this operating state, separate, internal parameters are used for the traversing speed. Feedforwarding via an analogue input is impossible.

Moreover, it is possible to parameterise a residual speed.

Troubleshooting

The following faults are signalled by a high level at switching output DO7:

- Monitoring of the analogue inputs for falling below or exceeding certain ranges in accordance with the set limits.
- Monitoring of the SSI encoder for cable break
- Valve monitoring (comparison of command/actual)

The following faults result in a stop (analogue output d30 = 0):

- Monitoring of the supply voltage, all internal voltages as well as the ±10V reference voltage.
- Monitoring of the microcontroller itself (watchdog) as well as of the memory (checksum)

Front panel operation

In conjunction with the 4 keys, the front display serves for displaying and changing parameters as well as for diagnosis purposes.

Access to the parameters of the HACD-B is provided by a corresponding menu structure. The parameter values can be displayed and changed.

The following parameters can be accessed:

- Target position A and B
- Speed, including ramp times, A->B and B->A
- Start of braking, A->B and B->A
- Residual speed, A->B and B->A
- Configuration of analogue I/O
- Configuration of SSI

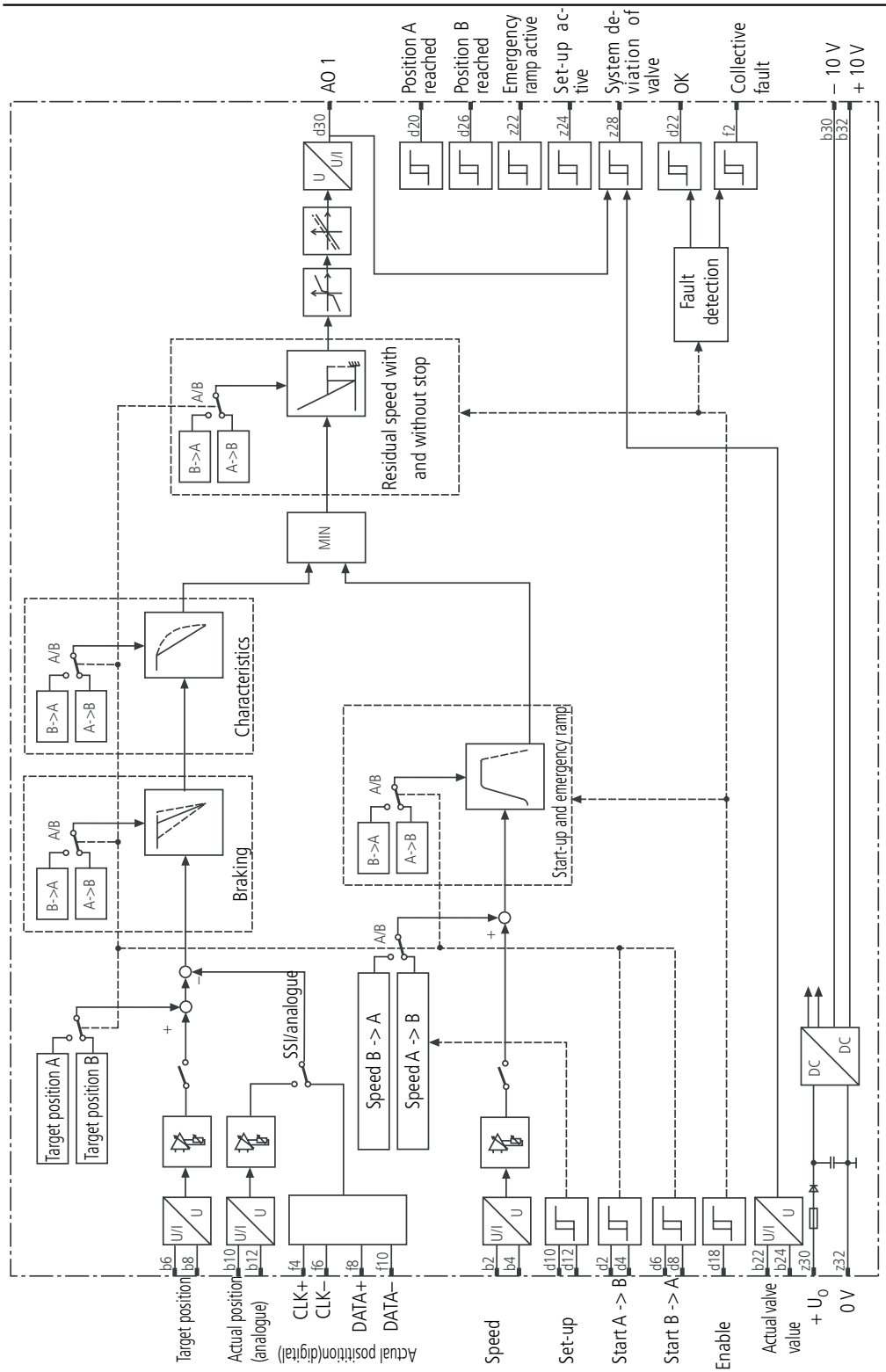
Changes to the configuration, e.g. braking characteristics and the use of analogue inputs or internal parameters are possible by front panel operation.

The diagnosis options include the display of command and actual values as well as the output of fault messages.

PC program BODAC

The PC program BODAC allows the configuration, parameterisation and diagnosis of the HACD-B via a serial interface (RS 232).

Block circuit diagram: VT-HACD-B



Technical data (for applications outside these parameters, please consult us!)

Operating voltage	U_O	24 VDC + 40 % – 10 %
Operating range:		
– Upper limit value	$u_O(t)_{max}$	35 V
– Lower limit value	$u_O(t)_{min}$	21 V
Current consumption	I_{max}	150 mA
Fuse	I_S	4 AT
Digital inputs	U	log 0 = 0 to 5 V log 1 = 15 V to U_O
Digital outputs	U	log 0 = 0 to 5 V log 1 = 15 V to U_O I_{max} = 30 mA
Analogue inputs		
Configuration as voltage input		
Range	U	0 to 10 V or ±10 V (configurable)
Input resistance	R_i	100 kΩ, > 10 MΩ for input AI 3
Resolution		5 mV for range ±10 V, 2.5 mV for range 0...10
Non-linearity		< 10 mV
Configuration as current input		
Range		0...20 mA or 4...20 mA (configurable)
Input resistance	U	100 Ω
Current loss	R_i	0.5 % (with 500 Ω between pin AI x – and 0 V)
Resolution		5 µA
Analogue outputs		
AO 1 configuration as voltage output		
Output voltage	U	0 ... 10V or ±10 V (configurable)
Output current	I_{max}	20 mA load Rmin 500 Ω
Resolution		1.25 mV (14 bits)
Residual ripple content		± 15 mV (without noise)
AO 1 configuration as current output		
Output current	U	0...20 mA or 4...20 mA (configurable)
Load	R_{max}	500 Ω
Resolution		1.25 µA
Residual ripple content		± 15 µA (without noise)
Reference voltage	U	± 10 V
	Imax	30 mA
	Residual ripple content	< 20 mV
Scanning rate	T	2 ms
Ramp time	t_{max}	300 s
Serial interface		RS 232 (front panel), D-sub socket
Type of connection		64-pin male connector, DIN 41 612, form G
Card dimensions		Euro-card 100 x 160 mm, DIN 41 494
Front panel dimensions:		
– Height		3 HE (128.4 mm)
– Width soldering side		1 TE (5.08 mm)
– Width component side		7 TE
Permissible operating temperature range	ϑ	0 to 50 °C
Storage temperature range	ϑ	– 20 to + 70 °C
Weight	m	0.2 kg

Note:

For details regarding **environment simulation testing** in the fields of EMC (electromagnetic compatibility), climate and mechanical stress, see RE 30143-U (declration on environmental compatibility).

Pin assignment of male connector

Pin	Row z	Row b	Row d	Row f
2	n.c.	Speed [1]	Start A -> B [4]	Collective fault
4	n.c.	Speed [1]	Start A -> B [4]	Actual value SSI clock pulse +
6	n.c.	Target position + [1]	Start A -> B [5]	Actual value SSI clock pulse –
8	n.c.	Target position– [1]	Start A -> B [5]	Actual value SSI data +
10	Shield	Actual value, analogue + [3]	Set-up [6]	Actual value SSI data –
12	n.c.	Actual value, analogue – [3]	Set-up [6]	n.c.
14	n.c.	n.c.	n.c.	n.c.
16	n.c.	n.c.	n.c.	n.c.
18	n.c.	n.c.	Enable	n.c.
20	System ground	n.c.	Position A reached	n.c.
22	Emergency ramp active	Actual valve value +	OK	n.c.
24	Set-up active	Actual valve value –	n.c.	n.c.
26	n.c.	n.c.	Position B reached	n.c.
28	System deviation, valve	Analogue GND	n.c.	n.c.
30	U_O: + 24 V	Reference voltage –10 V	Analogue output AO 1 [2]	n.c.
32	L0: 0 V	Reference voltage +10 V	n.c.	n.c.

[1] The inputs can be set to 0...10 V, ±10 V or 4...20 mA by means of software.

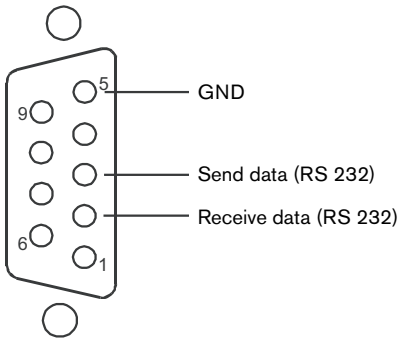
[2] Output AO 1 can be set to 0...10 V, ±10 V or 4...20 mA by means of software.

[3] This input has an input resistance of $R_i > 10$ MΩ.

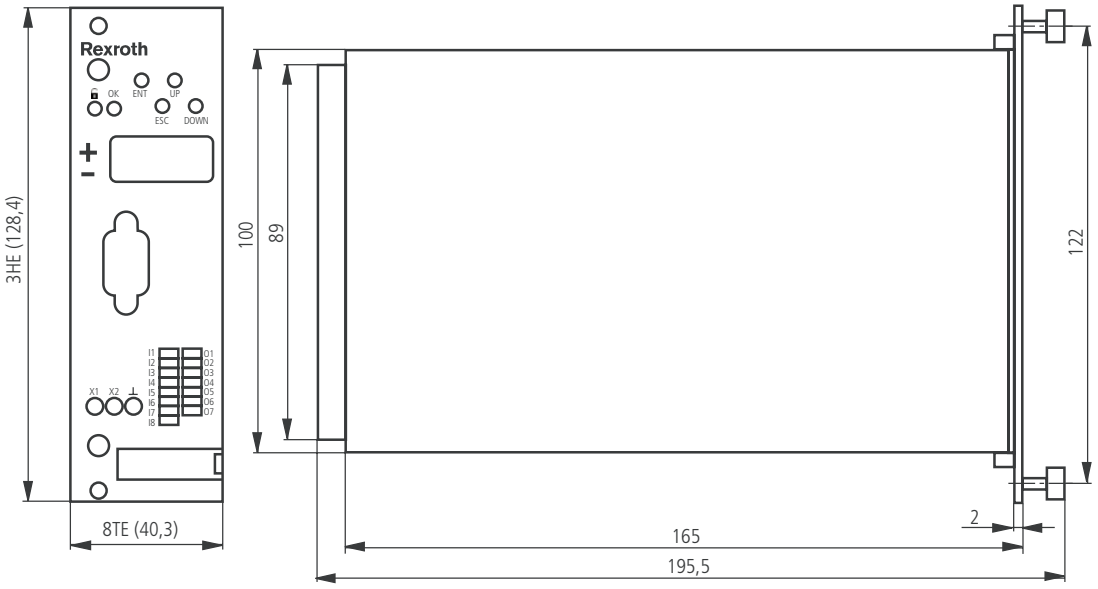
[4] [5] [6] The two inputs must be connected

n.c. ... not assigned in the basic version, but reserved for extensions.

Pin assignment of D-sub socket on the front panel



Unit dimensions (dimensions in mm)



Engineering / maintenance notes / supplementary functions

- Use low-capacitance cables. Whenever possible, establish cable connections without intermediate terminals.
- The arrangement of electromagnetic sources of interference (e.g. frequency converter) in the direct vicinity of the closed-loop control electronics is not permitted.
- Do not lay power cables in the direct vicinity of the controller card.
- Do not lay cables of the control electronics in the direct vicinity of power cables.
- Lay sensor cables separately.
- The distance to aerial lines, radio sources and radar equipment must be at least 1 metre.
- Engineer the system so that when the differential inputs are used, both inputs are always activated or deactivated simultaneously.
- Use relays with gold-plated contacts for passing on command values (small voltages, small currents).
- Always shield command value and actual value cables. Connect the shield to “shield” on the card side and leave the other end open, otherwise, there is a risk of earth loops.
- Use highly flexible CU conductors (min 2.5 mm2) for connecting the system ground!
  The system ground is an essential part of EMC protection of the controller card. It discharges interference that is transported via data and supply voltage cables to the controller card. This function can only be ensured, if the system ground itself does not inject interference into the controller card. Rexroth recommends that solenoid cables be shielded as well.
- Electrical signals brought out via control electronics (e.g. the “OK” signal) must not be used for switching safety-relevant machine functions!
  (See also European Standard “Safety requirements for fluid power systems and components - hydraulics“ EN982:1996)

Notes

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