Black Bruin

Product manual
CVM / CVU / CTR

Contents

1 General Instructions

1.1 About the manual

This manual contains the technical instructions for the Black Bruin CVM/CVU valves and the CTR control system. Take these instructions into consideration when planning the use of the product.

All information given in this manual is current and valid according to the information available at the time of publication. The manufacturer reserves the rights to implement changes without prior notice.

Please visit www.blackbruin.com for the most recent version of this manual. The product datasheets and the 3D-models are available from the manufacturer by request.

1.2 Intended use

The Black Bruin CVM/CVU valves and the CTR control system are part of the Black Bruin On-Demand Drive System.

Black Bruin On-Demand Drive System is a transmission solution for tractor-driven trailers and working equipment.

It is particularly suitable for an equipment that periodically requires additional power and is pulled without hydraulics.

These products are only suitable for use with freewheeling Black Bruin motors.

1.3 Warranty

Check the package and the product for transport damage when receiving goods. The package is not meant for long term storage; protect the product appropriately.

Do not dismantle the product. The warranty is void if the product has been disassembled.

The manufacturer is not responsible for damages resulting from misinterpreted, non-compliance, incorrect, or improper use of the product that goes against the instructions given in this document.

1.4 Product identification

The product identification data can be found on the identification plate attached to the product.

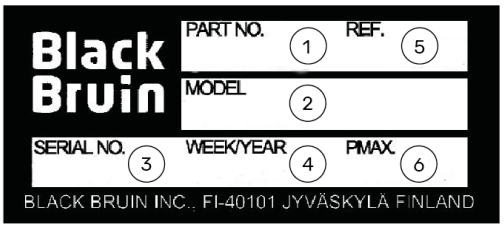


Figure 1. Identification plate of the valve.

1. Part number
2. Model
3. Serial number
4. Manufacturing date
5. Reference number
6. Maximum allowed operating pressure

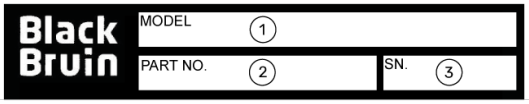


Figure 2. Identification plate of the control system.

1. Model
2. Part number
3. Serial number

1.5 Revision comments

25.10.2017 (Software version 2.1.0) - This manual is published.

2 Safety Instructions

The following instructions apply to all procedures associated with the product. Read these instructions carefully and follow them closely.

- Use necessary personal protective equipment when working with the product.
- Support the product properly. Make sure the product cannot fall over or turn around by accident.
- Use only appropriate equipment and attachments for lifting and transferring the product.
- Prevent unintended use of the product during installation and maintenance procedures by preventing pressurization of the hydraulic lines.
- The operating temperature of the product may be over 60 °C (140 °F), which is hot enough to cause severe burns. Beware of hot hydraulic fluid when disconnecting the hydraulic connections.

2.1 Warning symbols

The following symbols are used in this manual:

Note:

Useful information.

Danger:

Danger of death or injury.

Attention:

May cause damage to the product.

3 Product Description

3.1 Working principle

The CTR control system has two modes:

- a driving mode
- a freewheeling mode.

The system can be easily switched from one mode to another. Use the freewheeling mode when moving at road speeds and switch the driving mode on when you need the additional power.

Typical operating situations for the driving mode:

- driving up steep hills

- reversing on steep hills

- crossing obstacles

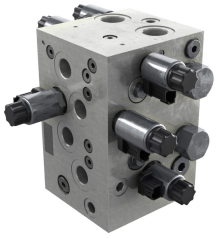
- driving on slippery or soft surfaces

The user can preset a tractive power level that will be used even if the speed changes.

To protect the motor from overloading, the control system switches automatically to the freewheeling mode when the speed increases and the hydraulic system's flow capacity is exceeded.

If the wheels of the vehicle are slipping, the assisting traction control (ATC) increases the power of the wheels with a better grip.

3.2 Main components

1	2	3	4
			
Valve • Switching motors to driving and freewheeling mode • Driving direction change • Displacement control of two-speed motors • Pressure level (tractive power) adjustment • Assisting traction control (ATC)	**Hydraulic motor** • Wheel hub motor • No pressure required in freewheeling mode • More extensive driving speed range with inbuilt two-speed valve	**Control device** • Controls the system functions • Controls the valve • Measures the pressure from the system's pressure sensors	**Display** • System control element • Informs the user of the system's operation

3.3 Valve models

	CVM120 / 2WD	CVM120 / 4WD	CVU200 / 2WD
Maximum flow rate	120 l/min	120 l/min	200 l/min
Fixed displacement pump	•	•	
Load-sensing (LS) pump	•	•	•

4 Hydraulic System: CVM/CVU valves

4.1 System design

When planning to use of the CVM/CVU valves, please note that

- Use the CVU200 valve only in a system with a load-sensing pump and an LS line.
- The CVM/CVU valves are not suitable for use in a closed-circuit hydraulic system.
- The hydraulic fluid viscosity must be at least 15 cSt. The recommended viscosity is 25–50 cSt.
- The hydraulic fluid cleanliness in accordance with ISO 4406 should be at least 18/16/13. The use of hydraulic filters is recommended especially in working pressure (P) line.
- The hydraulic fluid temperature must be below 75 °C.
- The system's work pressure line must have a pressure relief valve to limit the main pressure before the CVM/CVU valve.
- It is recommended to use hose sizes that match the connections on the valve. Excessively small hoses will cause pressure loss and may disturb the operation.
- The drain line ("C" in the hydraulic connection diagram) branching point must be positioned as close to the valve as possible.

4.2 Hydraulic system connections

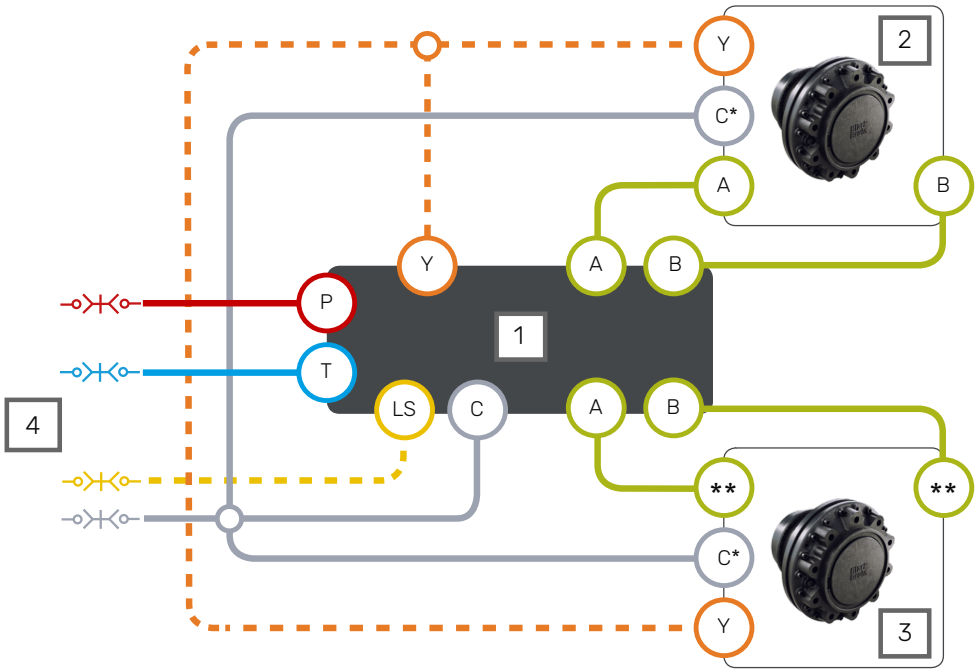


Figure 3. Connection diagram, 2WD.

1	Valve	2	Motor, right	3	Motor, left	4	Hydraulic lines to the tractor

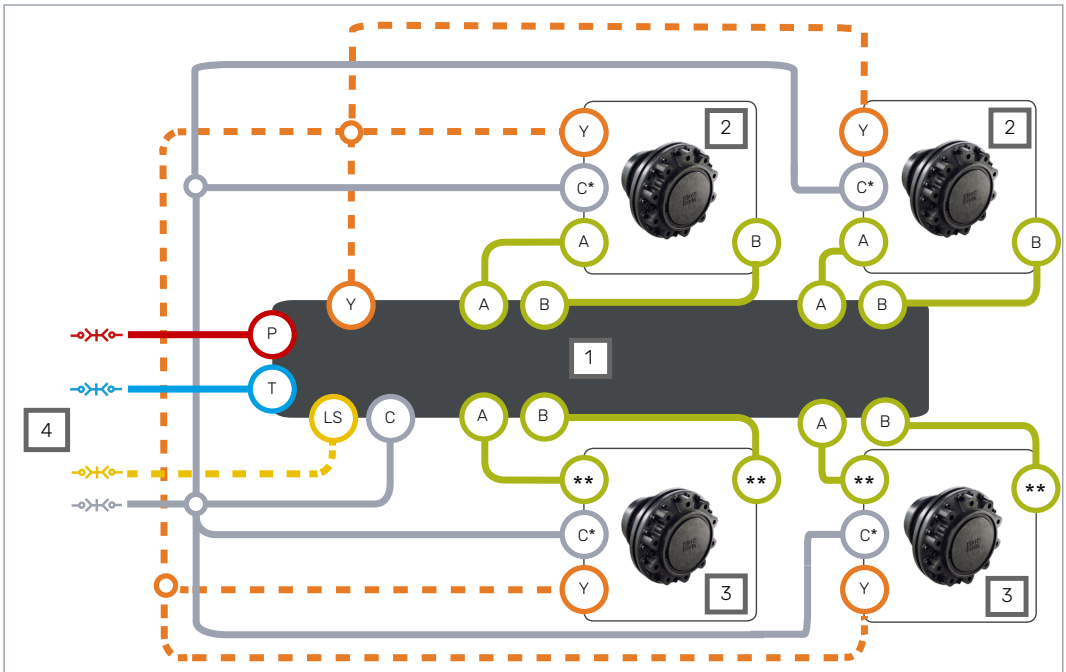


Figure 4. Connection diagram, 4WD.

1	Valve	2	Motor, right	3	Motor, left	4	Hydraulic lines to the tractor

* The marking of the drain line (C) is (C2) in motors with flushing line (C1).

** Verify the rotating direction of the left motor in the motor's datasheet. Connect the left motor according to the table below.

Table 1: Connections, motor to valve.

Vehicle side	Motor type	Connections: motor to valve	
Right side	1-speed	A to A	B to B
	2-speed, CW preferred	A to A	B to B
Left side	1-speed	A to B	B to A
	2-speed, CCW preferred	A to A	B to B

Attention:

The direction of rotation of the right motor must be CW.

Two-speed motors in the CW direction are not suitable for use on the left-hand side.

We recommend that you use a Power Beyond hydraulic interface connected to a load sensing pump. If that is not available, connect the lines P and T to the tractor valves.

Note:

Flow direction is from line P to line T.

Attention:

Do not combine lines C and T.

Connect the line C always to the reservoir without valves.

Table 2: Port sizes.

Port	CVM120 valve	CVU200 valve
P, T, C	G3/4"	G1"
A1, B1, A2, B2	G1/2"	G3/4"
Y	G3/8"	G3/8"
LS, MC, MP, M_A2, M_B2	G1/4"	G1/4"

Note:

The motor port types and rotating direction are indicated on the motor datasheet.

4.3 Port pairs

The port pairs of the valve's A and B lines are marked as A1/B1 and A2/B2.

Always connect each motor to port pair as indicated in the figure.

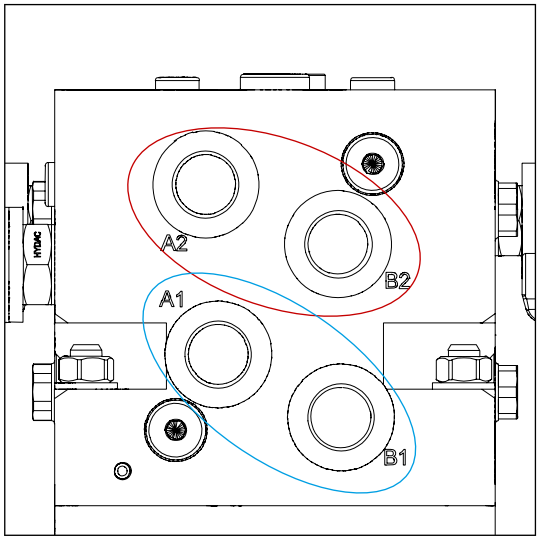
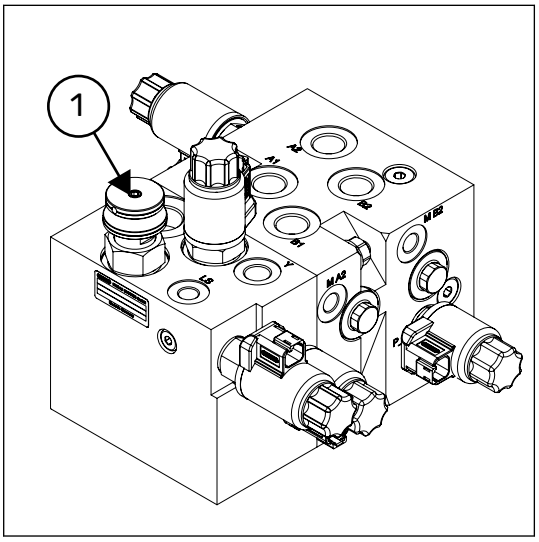


Figure 5. The port pairs.

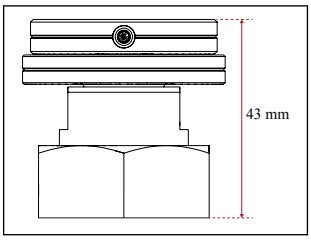
Left and right side motors can be connected to any port pair.

4.4 Installation

1. Connect the hoses to the valve according to the hydraulic diagram (see *Hydraulic system connections* on page 8).
2. Install the system's pressure sensors (400 bar) on measurement points M_A2 and M_B2.
3. CVM120 valve only: set the DW valve (1) to the setting determined by the pump type and available connections.

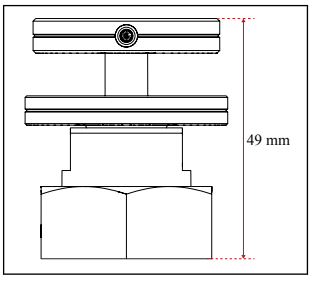


a.



DW Valve setting when the valve is connected to the LS line.*

b.



DW Valve setting when the LS line is closed with a plug.*

* Tighten the lower nut.

4. Replace the plastic plugs in all unused ports with metal plugs (metal plugs not included in delivery). Port sizes are indicated in chapter *Hydraulic system connections* on page 8.
5. Install the motors and bleed air from the motors as described in the motor manual.

Note:

- If the two-speed function is not used, plug the Y connection on the valve.
- CVM120 valve only: If the tractor is not equipped with an LS connection, plug the LS port on the valve.
- 4WD only: The valve has two pairs of M_A2 and M_B2 measurement points. Install the pressure sensors to either pair and plug the remaining pair.

Note:

The location of measurement points, ports etc. are indicated in technical data (see *Technical data* on page 28).

5 Control System: CTR

5.1 System design

When planning to use of the CTR control system, please note that

- The control system operating voltage is 12 V. Do not connect the system to a different voltage.
- For the power supply, please note the system's current requirement is 15 A.
- When the control device is unpowered, the system switches to freewheeling mode. Make sure the power supply to the control device can be switched off from the tractor cab, for example with an emergency stop button.
- Attach the control device near the valve in the location where it is not subjected to mechanical shocks.
- Install the cables in a way they are not subjected to stress or abrasion and they will not get crushed between the moving parts of the machine.
- The system components have been classified as water-resistant, but avoid immersing the components fully under water.
- Install the display in the tractor cab. Use the included mounting set.

5.2 Control system connections

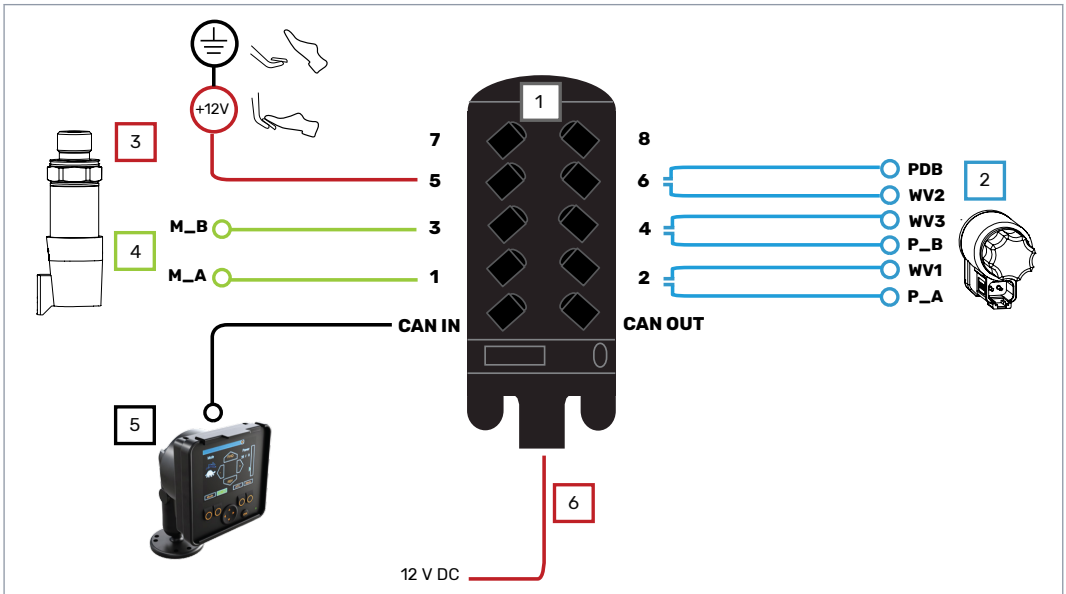


Figure 6. Connection diagram, 2WD.

1	Control device		
Cables	**Description**	**Cable ID**	**Length [m]**
2	Valve cables	see *figure*	1
3	Brake signal cable*	Brake_sig	10
4	Pressure sensor cables	M_A, M_B	1
5	Display cable	Display	10
6	Power cable	Power	10

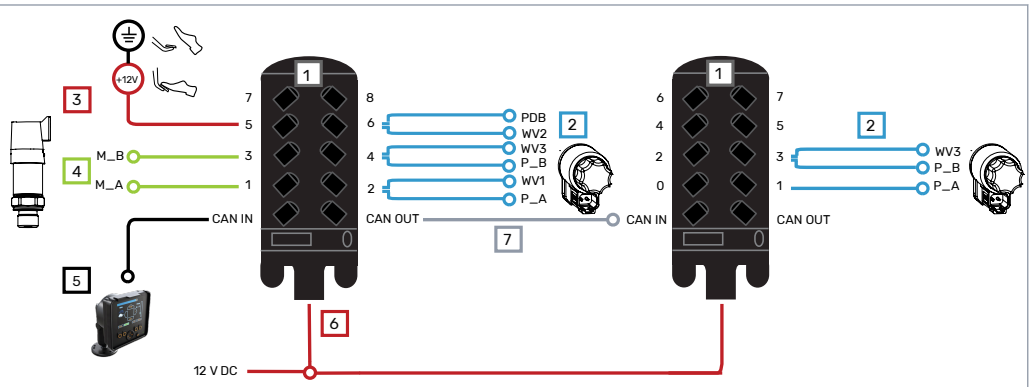


Figure 7. Connection diagram, 4WD.

1	Control devices		
Cables	**Description**	**Cable ID**	**Length [m]**
2	Valve cables	see *figure*	1
3	Brake signal cable*	Brake_sig	10
4	Pressure sensor cables	M_A, M_B	1
5	Display cable	Display	10
6	Power cable	Power	10+1
7	CAN bus cable	Link	1

*When the brake is active, the signal on "+" lead must be 12 V. When the brake is not active, the signal must be 0 V (earth level).

Verify the valve solenoid locations from technical data (see *Technical data* on page 28).

Table 3: Connectors

Connector	Use	
Deutsch DT06-6S	Control device: CAN and 1-8 sockets	
AMP MCP 2.8 6-pin	Control device: Power socket	
Deutsch DT06-2S	Valve solenoid	
Deutsch DT04-3S	Pressure sensor	
M12 x 1, 5-pin	Display	
Free conductors	System power and brake signal	

5.3 Installation

1. Install the control device in a suitable location from the attachment points.
2. Connect all the cables of the display, pressure sensor and valves in accordance with the connection diagram (see *Control system connections* on page 12).
3. Use dedicated CAN plug for open CAN OUT socket.
4. Plug other unused sockets on the control devices using plugs included.

Danger:

Make sure the system is unpowered before installation.

5.4 Display

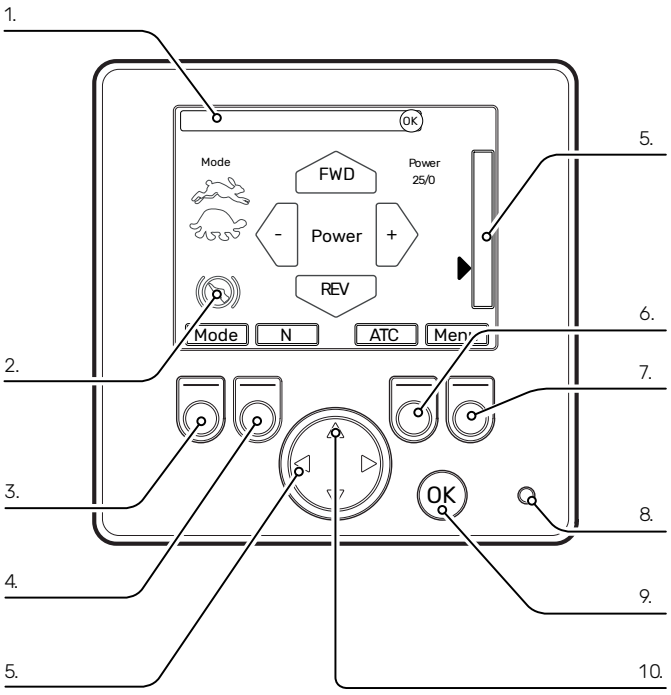


Figure 8. The main view and the buttons.

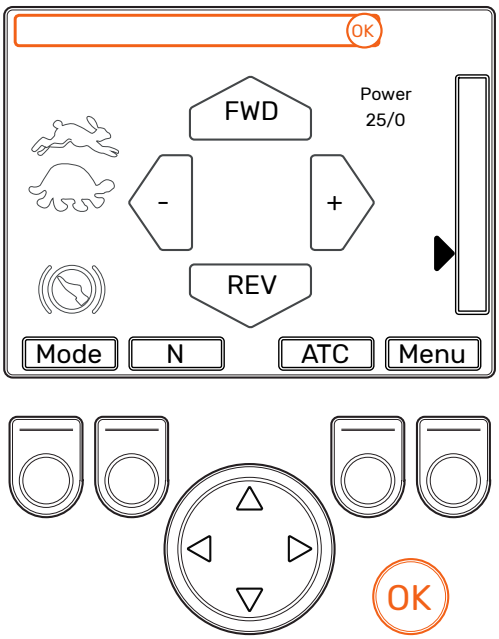
1	Status bar	6	**F3** Assisting traction control (ATC)
2	Brake indicator	7	**F4** Menu (Menu)
3	**F1** Speed range selection (Mode)	8	Status indicator light
4	**F2** Freewheeling (N)	9	Reset (OK)
5	Tractive power adjustment(Left, Right), tractive power indicator	10	Driving direction selection (Up, Down)

5.4.1 Display functions

1. Status Bar

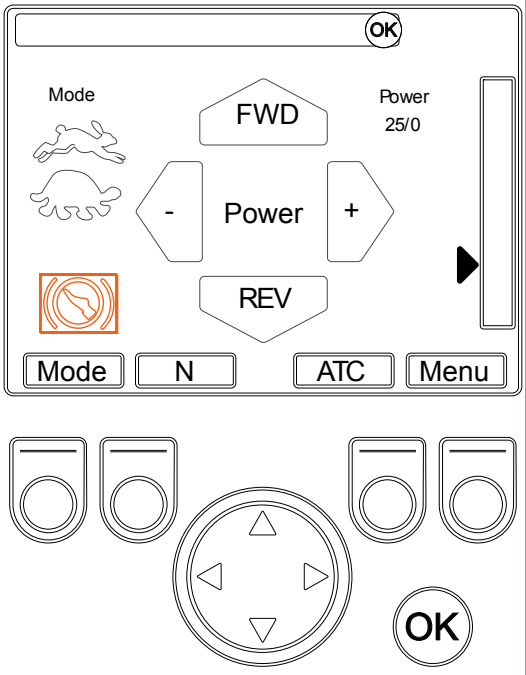
Shows notifications, warnings and alarms. In the driving screen, push the *OK* button to reset an alarm or warning in the status bar. If the cause of the alarm has not been removed, the alarm cannot be reset. For more detailed descriptions, refer to *Troubleshooting* (see *Troubleshooting* on page 26).

- Notification; Blue background
- Warning; Yellow background
- Alarm; Red background



2. Brake indicator

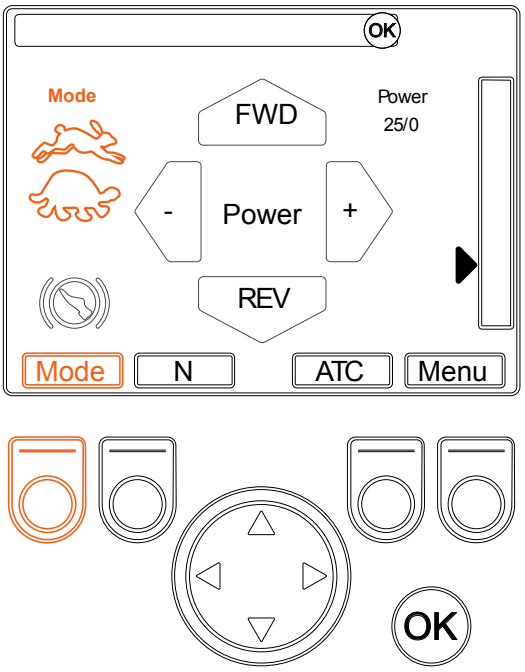
The *brake activated* symbol is displayed when the system detects a brake signal. Refer to *Driving direction*.



3.Speed range selection (Mode), (F1)

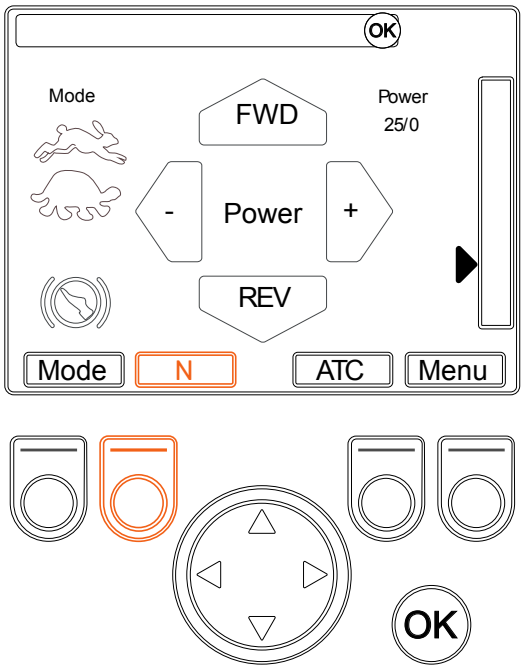
This selection is used when you drive forward and use two-speed motors.

- Low-speed range (*Turtle* symbol); a higher tractive power
- High-speed range (*Rabbit* symbol); when the speed increases, it is necessary to change to the high-speed range in order to sustain a sufficient flow rate to the motors.



4. Freewheeling (N), (F2)

Push the freewheeling button to set off the traction. When the *N* symbol is green, the system is in the freewheeling mode.

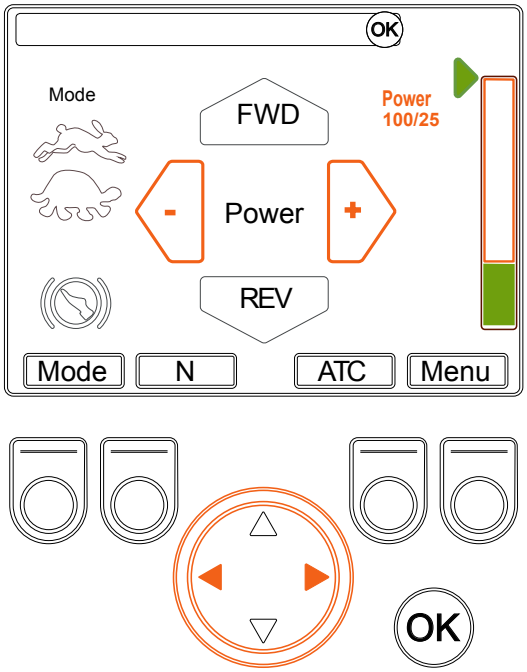


5. Tractive power levels

Select the power level using the arrow buttons (*left/right*). Power levels are 0, 25, 50, 75 and 100% of the maximum level. Preset the desired level in the freewheeling mode and change it during the driving mode.

- Decrease power; **<**
- Increase power; **>**
- Tractive power set/Tractive power measured;**100/25**

The set value is indicated by the green arrow and the measured value by the bar displayed next to it.

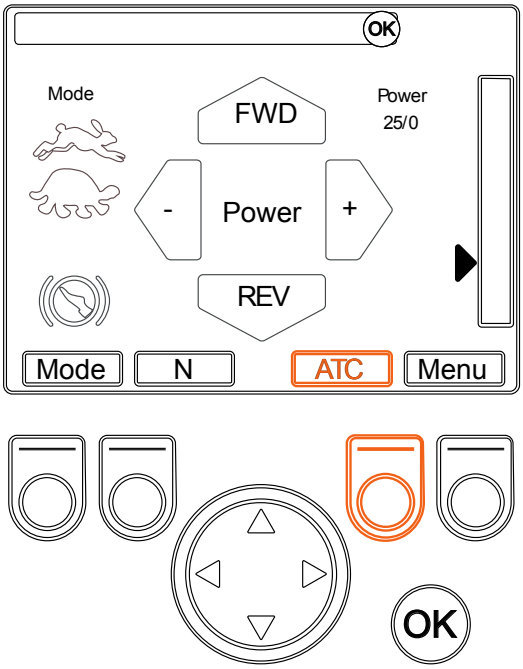


6. Assisting traction control (ATC), (F3)

Use the *ATC* button to set the assisting traction control on and off. The assisting traction control increases the power of the wheels with a better grip when wheels are slipping. When the assisting traction control is active, the *ATC* symbol is green.

Note:

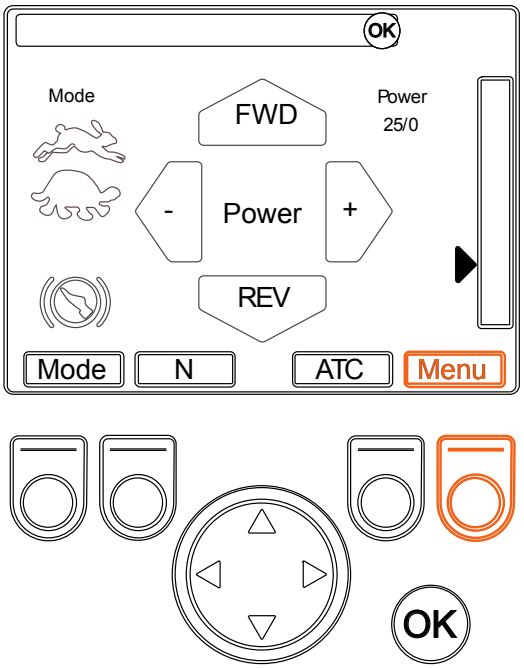
The hydraulic fluid temperature may increase if you use the assisting traction control and the wheels slip constantly.



7. Menu (Menu), (F4)

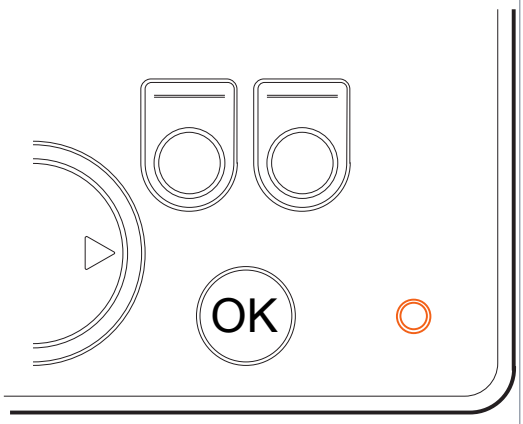
Use the *Menu* function when you adjust settings and view the system information.

Menu function is not available in driving mode.



8. Status indicator light

- No light; No operating voltage
- Orange flash; System start-up
- Green 5 Hz; No equipment software
- **Green 2 Hz; Normal operation**
- Green continuous; Software error
- Red continuous; Undervoltage
- Red 5 Hz; Serious system fault

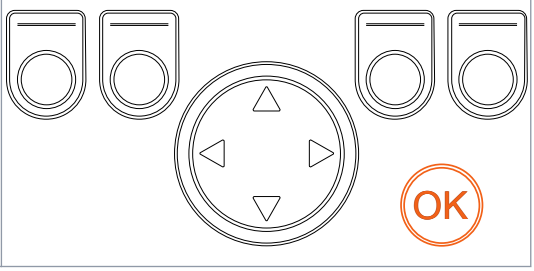


9. Reset (OK)

Push the *OK* button to reset an alarm or warning in the status bar.

Note:

If the cause for the alarm has not been removed, the alarm cannot be reset.



10. Driving direction

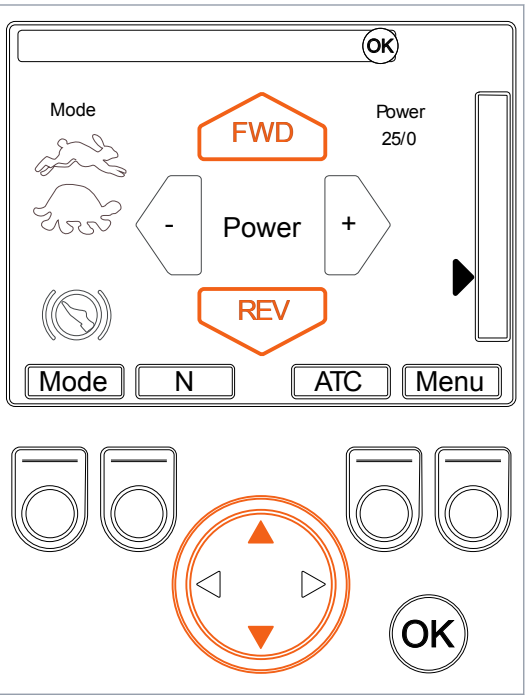
The arrow buttons (up/down) sets the direction between forward and reverse.

The system starts to move instantly after the direction selection.

The symbol of the active driving direction is highlighted in yellow. If the system is in driving mode but the brake pedal is pressed, the symbol blinks. Press the active driving direction button after braking to restore the tractive power.

Note:

Pushing the button of the opposite direction in driving mode, the system engages to the freewheeling mode.



5.4.2 Menu settings

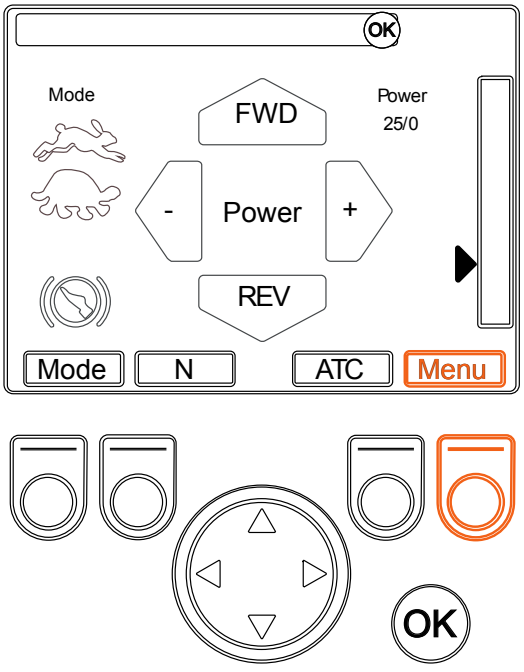
1. Main menu

Open the main menu from the main display with the (Menu) F4 button.

Note:

The menu opens only when the system is in the freewheeling mode.

Return back to the driving mode with the (Back) F4 button.



2. Language and display brightness

The display brightness and the system language are adjusted in the main menu.

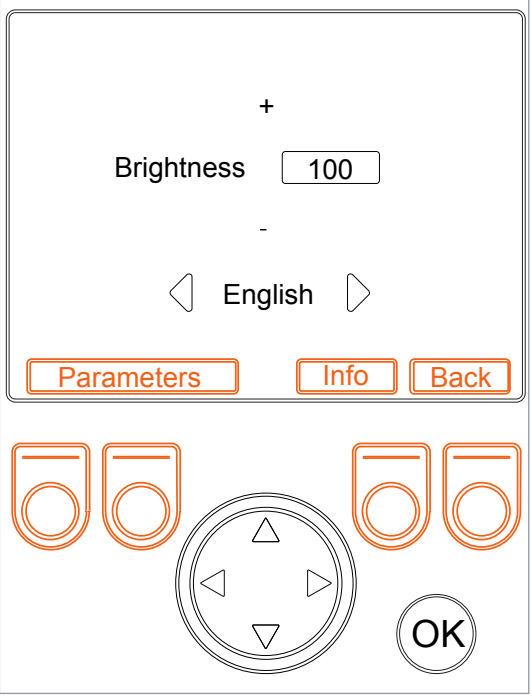
- Arrow buttons up/down; adjust the display brightness on a scale from 0 to 100.
- Arrow buttons left/right; select the system language

3. Parameter and system information menus

Parameter menu includes the settings related to the operation of the system.

Info menu includes the information about the system operations, for example operating hours and latest fault messages.

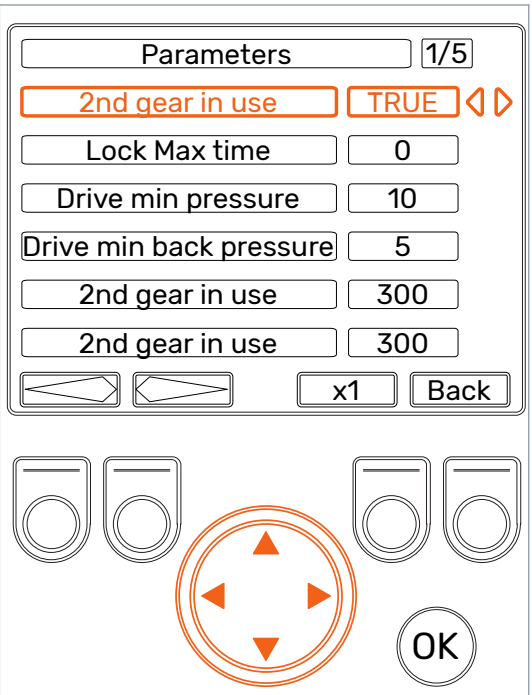
- Open the parameter menu (Parameters); F1
- Open the info menu (Info); F3
- Return to the main menu (Back); F4



4. Parameter selections

Examine the Parameter table below for the detailed descriptions of the parameters and the options in use.

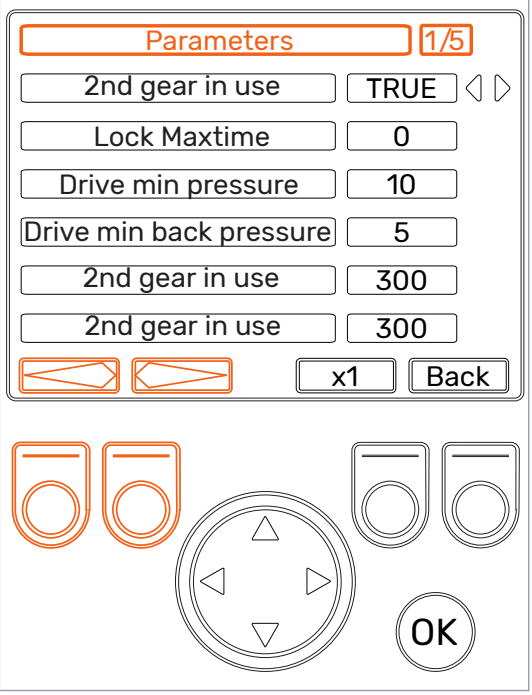
- Arrow buttons up/down; select the parameter.
- Arrow buttons left/right; change the parameter value.



5. Parameter selection, page scrolling

The parameter list includes several pages. The page number and the total amount of pages are shown in the topright corner of the display. Scroll the pages with the buttons F1 and F2.

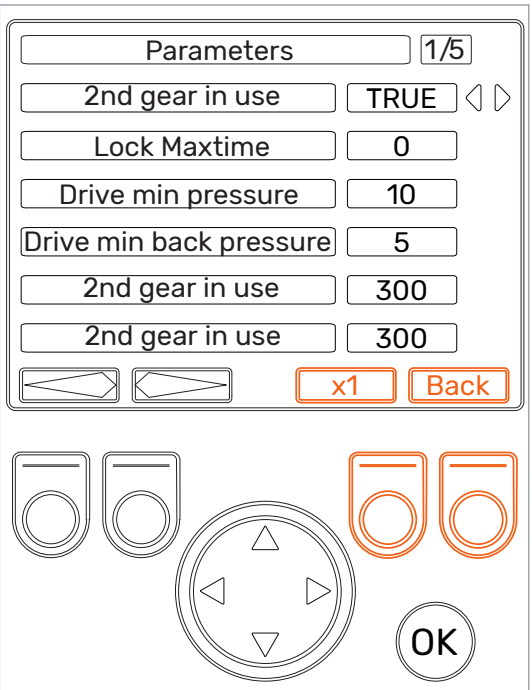
- Previous page; F1
- Next page; F2



6. Parameter multiplier

The multiplier defines the step value in which the parameter value can be changed. This is useful when you have to adjust large values. The multiplier values are x1, x10, x100 and x1000.

- Change the multiplier value; F3
- Return to the main menu (Back); F4

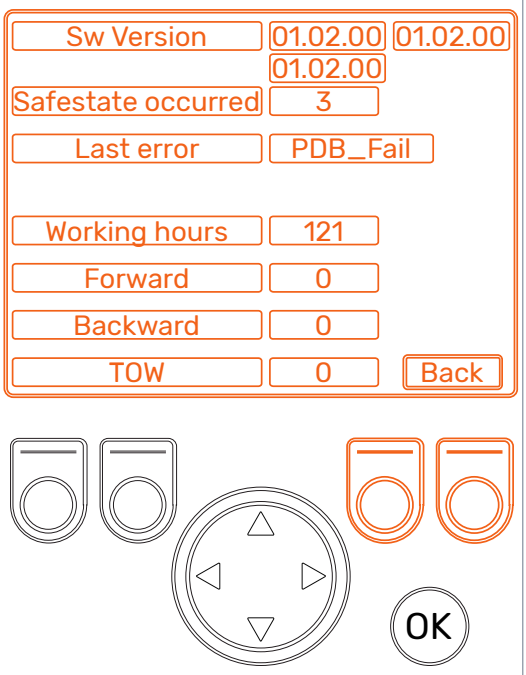


7. System information

Open the system information with the button F3 in the main menu.

Info menu includes the information about the system and operations. This information is required for example for support requests and troubleshooting.

- Sw Version; Software version numbers. The leftmost fields shows the control device software versions and the rightmost field the display software version.
- Safestate occurred; Number of times the system has been occurred to a safe state.
- Last error; Latest alarm message. The alarm codes are listed in the chapter *Troubleshooting* (see *Troubleshooting* on page 26).
- Working hours; System operating hours.
- Forward; Number of times the system has been activated to the forward driving mode.
- Reverse; Number of times the system has been activated to the reverse mode.
- TOW; Number of times the system has been activated to the freewheeling mode.
- Back to main menu (Back); F4



5.5 Parameter table

Adjust the listed parameters before you use the system for the first time.

Danger:

Do not change parameters not included in the list below.

Parameter	Description	Values to be set
2nd gear in use	Defines the motor type (one-speed motor/two-speed motor) connected to the system.	TRUE – two-speed motors have been connected to the system. FALSE – one-speed motors have been connected to the system.
ATC max time	Specifies how long the ATC assisting traction control will be used with a single activation.	0 – no limit for the activation time 1 – activation time in seconds
Drive min pressure	Minimum pressure level during driving. When the pressure level falls below this value for the duration of the delay (see the following parameter *Autofree delay*), the system will automatically switch to freewheeling mode.	Pressure level [bar]. 10–20 bar is recommended as an initial value. If the motors make a rattling sound before switching to the freewheeling mode, increase the value.
Autofree delay	Activation time of the automatic freewheeling. During driving, when the pressure stays below *Drive min pressure* for the duration of this delay, the system will automatically switch to the freewheeling mode. Also see the parameter *Drive min pressure*.	Reaction time [ms]. 300 ms or less is recommended as an initial value. The shorter the time, the sooner the system will switch to freewheeling mode when the working pressure decreases. Increase the value if the system switches to the freewheeling too easily, e.g. when crossing an obstacle. Decrease the value if the motors start rattling as the speed increases before the automatic switch to freewheeling.
Drive force set ramp	Ramp time used in power level adjustment.	Ramp time [ms]. Short time – aggressive operation Long time – smooth operation
Max pressure level	Maximum pressure level of the system equals power level 100%	Pressure level [bar]. The default value is 320 bar. Use this setting to limit the system pressure. Verify the allowed operating pressures of other components (hydraulic motors, pump, hoses, etc.).
Drive start pressure	Pressure when the system starts to move.	The default is 0%. The power percentage from which the pressure starts to increase towards the power level set.
Drive FWD ramp time	Ramp time of pressure increase when switching to the forward driving mode.	Ramp time [ms]. 1000 ms is recommended as an initial value. Time it takes for the pressure to increase to the power level selected by the user.

Control System: CTR

Parameter	Description	Values to be set
Drive REV ramp time	Ramp time of pressure increase when switching to the reverse mode.	Ramp time [ms]. 1000 ms is recommended as an initial value. Time it takes for the pressure to increase to the power level selected by the user in reversing mode.

6 Commissioning

We are almost there now. Let's ensure once more that everything is in order.

Table 4: Checklist.

Description	Checked
The working pressure (P), return (T), drain line (C) and load-sensing (LS) (if available) have been connected to the valve.	
Working lines (A) and (B), drain line (C) and two-speed function control (Y) (if used) have been connected to the motors.	
Unused connections on the valve have been plugged (see *Hydraulic system connections* on page 8).	
If using the CVM120 valve, the correct setting of the DW valve has been verified (see *Installation* on page 10).	
The motors have been fastened and air has been bled from them as described in the motor manual.	
The pressure sensors have been connected to valve connections (M_A2) and (M_B2).	
The control system's valve cables have been connected to the solenoids corresponding to the instructions.	
The control system's pressure sensor cables have been connected to the pressure sensors corresponding to the instructions.	
The control system's brake signal cable has been connected according to the connection instructions.	
The display cable has been connected.	
The power supply cable has been connected and a sufficient power supply capacity (15 A) has been confirmed.	
The control system has been switched on and no alarms have appeared on the display.	
2WD: No text in segment display on control device, green PWR led is blinking. **4WD:** Text 'A' in segment display on one control device and text 'B' on the other one, green PWR led is blinking. Differing information on display(s) indicates incorrect operation of a system. In this case check cable connections.	
The maximum pressure level of the system components has been verified and set in the control system parameters.	
It has been specified in the control system parameters whether the motors have the two-speed function.	
The operation of the brake signal has been verified – the brake symbol must appear on the display.	
The test drive has been performed and the parameters set. Time for a well-earned coffee break. All done!	

7 Operating Instructions

7.1 Use

Useful hints and recommendations for the operations:

Use the slow-speed (turtle) range when you drive slowly. This way you get the same tractive power with a lower power setting and a smooth torque.

It is possible to pre-select the high-speed (rabbit) range before switching the system to the driving mode. This way you can switch to the driving mode at a higher speed compared with using the low-speed range.

The hydraulic fluid flow rate increases, when you increase the speed in the driving mode.

Attention:

When the driving speed exceeds the maximum flow rate of the pump or the CVM/CVU valve, you must switch the system to the freewheeling mode to prevent damage.

Attention:

Do not switch to the driving mode if the speed is so high that the motors rattle constantly.

The phenomenon can be compared to shifting to a low gear at a high speed when driving a car.

Normal operating sounds which do not indicate a fault or misuse:

- When you switch to the freewheeling mode and the vehicle is moving, the motors make a rattling sound for a short time (approx. 1–3 seconds).
- When you switch to the driving mode, the motors make a sound.

Monitor the hydraulic fluid temperature in heavy use (long-term, continuous driving at high tractive power and use of ATC). Use, for example, a temperature measurement connected to the system's return line (T) or reservoir.

When driving forward, you can switch the ATC on and off on the display.

Note:

When reversing, the ATC is always in use.

7.2 Troubleshooting

The status bar in the main display shows all notifications, warnings and alarms. See the descriptions and corrective measures from the table below.

Table 5: Fault messages.

Fault message	Cause	Measures
PDB_Fail WV2_Fail P_A_Fail P_B_Fail WV3_Fail	No power to the valve solenoid PDB / WV2 / P_A / P_B / WV3.	Inspect that the valve cable has been connected to the valve solenoid and the cable is intact. Use a multimeter to inspect that the valve solenoid is not broken. Measure the solenoid resistance with the multimeter. If the resistance value is infinite, you must replace the solenoid.
Pressure_sensor_1_failure	The signal from pressure sensor P_A is faulty.	Inspect that the pressure sensor cable has been connected to the pressure sensor and the cable is intact. Inspect that the pressure sensor type is correct. If these measures do not solve the problem, the pressure sensor may be broken. Test this by, for example, switching pressure sensors P_A and P_B with each other. If the fault message changes, the pressure sensor is broken and must be replaced.
Pressure_sensor_2_failure	The signal from pressure sensor P_B is faulty.	
Pressure_high	The working pressure has exceeded 350 bar (or the other value set for the parameter "Max pressure level")	Inspect the setting of the main pressure relief valve (on the pump or as a separate valve). If you use the CVM valve, inspect the setting of the DW valve (see *Installation* on page 10).
Pressure_low	The working pressure is below the defined minimum pressure value and the system has automatically switched to the freewheeling mode.	The driving speed is too high for the selected speed range. You must switch earlier to the high-speed range or to the freewheeling mode. If the speed is not excessively high when the system shows the message, inspect the automatic freewheeling parameters (see *Parameter table* on page 22). Unlike the other alarms, the minimum pressure alarm does not require a reset.
Display_detached	The connection between the system's display and control device has been lost.	Inspect the connection of the cable connector to the display. Inspect that the cable connected to the display is not damaged.

8 Technical data

8.1 Control device

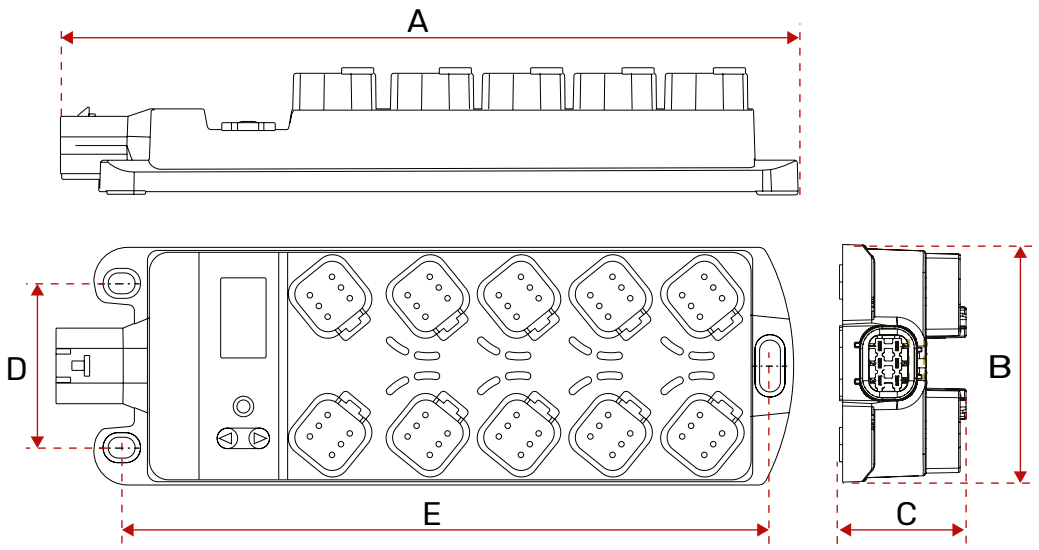


Figure 9. Control device, main dimensions.

Order code for control system	CTR100-A1H0U1P0S00 (complete 2WD system) CTR100-A2H0U1P0S00 (complete 4WD system)
External dimensions without cables (A x B x C)	234,2 mm x 76 mm x 40,5 mm
Control device attachment point dimensions (D x E)	52 mm x 205,5 mm
Protection class	IP 65, connectors attached: IP 67
Operating temperature	–40...+85 °C
Operating voltage	12 V DC
Power consumption	Max. 15 A

Note:

Free space required for connectors and connector cables: 100 mm above the control device and 100 mm in front of the power connector.

8.2 Display

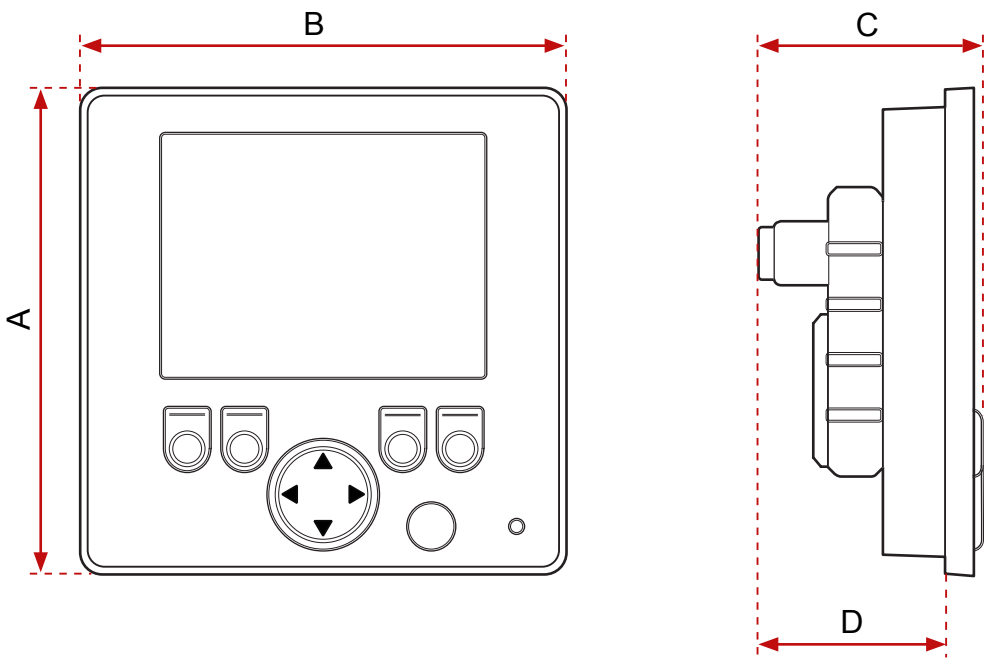


Figure 10. 2.8" colour display, main dimensions.

External dimensions (A x B x C/D)	87,5 mm x 87,5 mm x 37,8 mm /31,3 mm
Opening size in panel installation	81.5 ± 0.5 mm x 81.5 ± 0.5 mm
Protection class	IP 67 (installed) / IP 65 (not installed)
Operating temperature	–20...+70 °C

8.3 Pressure sensor

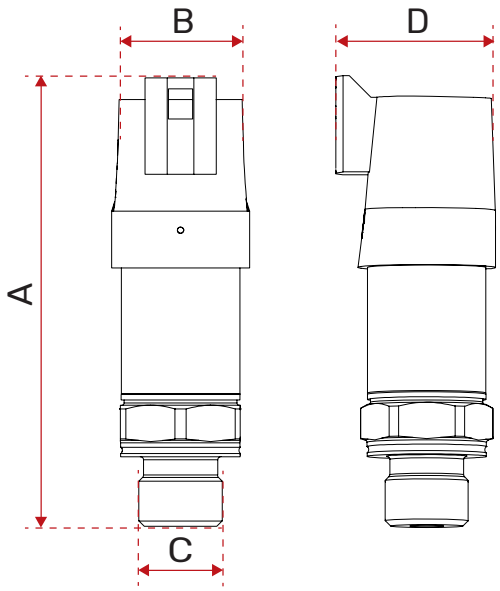


Figure 11. Pressure sensor, main dimensions.

External dimensions (A x B/D)	71,5 mm x 21,8 mm / 25,4 mm
Measurement range	0...400 bar
Cable connector	Deutsch DT04-3S
Process connection (C)	G1/4"

8.4 CVM120 2WD valve

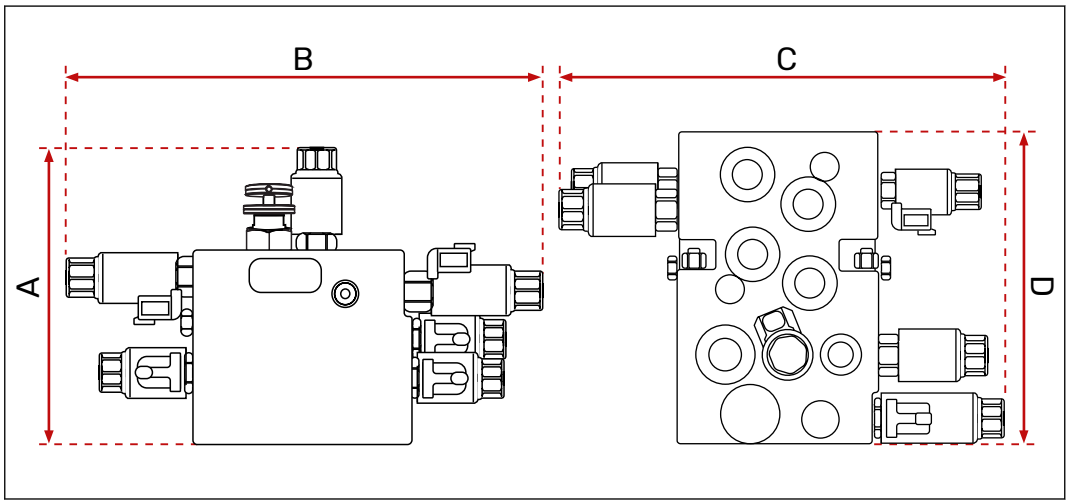


Figure 12. CVM120 2WD valve, main dimensions.

Order code	CVM120-A1H0T0V12S00
External dimensions (A x B) External dimensions (C x D)	196 mm x 307 mm 307 mm x 221 mm
Maximum pressure level	350 bar
Maximum flow rate	120 l/min
Operating voltage	12 V DC
Compatible pump	Load-sensing (LS) or fixed displacement, operation type can be selected from the valve.

More detailed technical information and dimensions; see the datasheet of the valve.

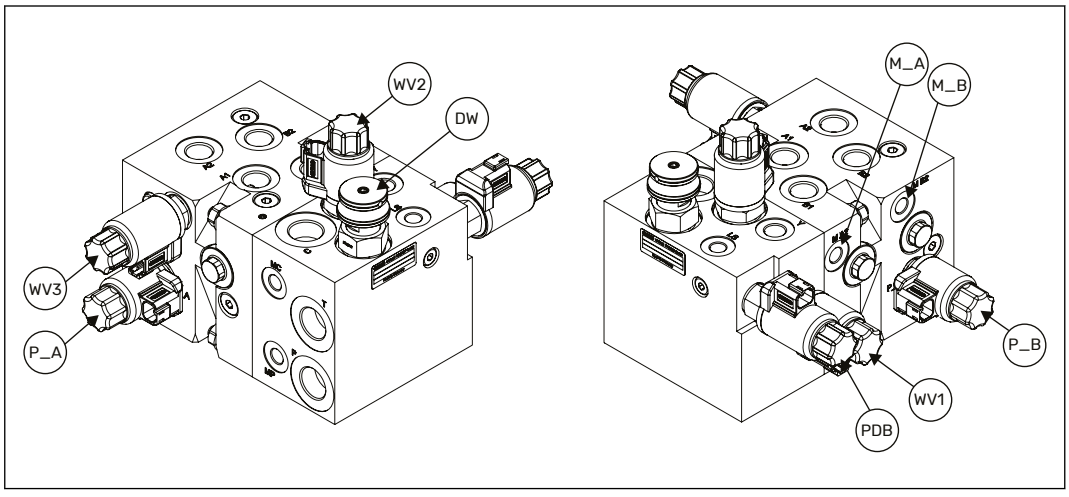


Figure 13. CVM120 2WD valve, locations of the valve connections.

8.5 CVM120 4WD valve

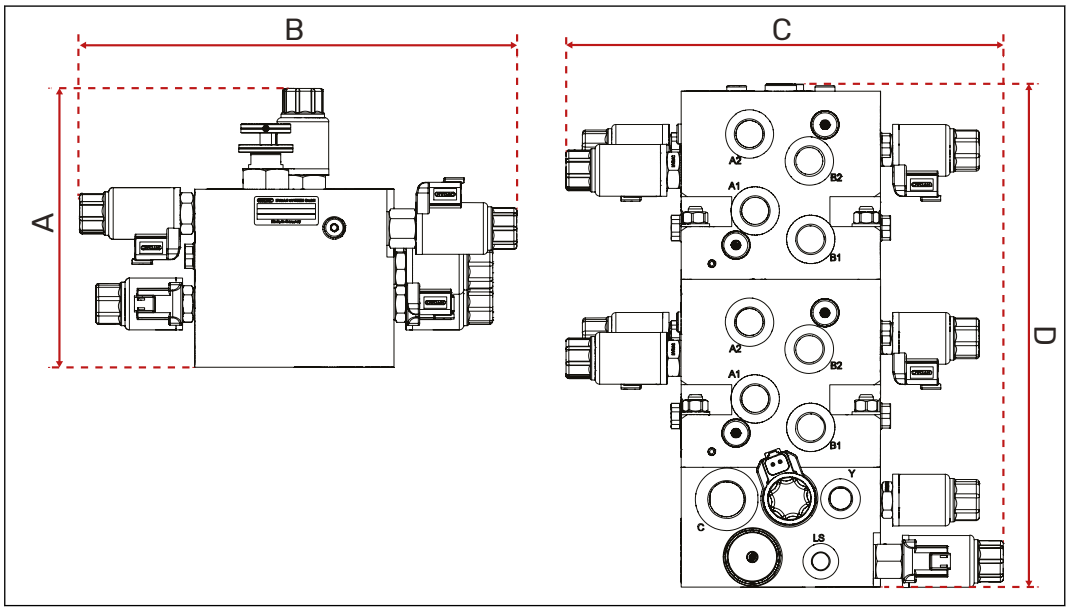


Figure 14. CVM120 4WD valve, main dimensions.

Order code	CVM120-A2H0T0V12S00
External dimensions (A x B) External dimensions (C x D)	196 mm x 307 mm 307 mm x 353 mm
Maximum pressure level	350 bar
Maximum flow rate	120 l/min
Operating voltage	12 V DC
Compatible pump	Load-sensing (LS)

More detailed technical information and dimensions; see the datasheet of the valve.

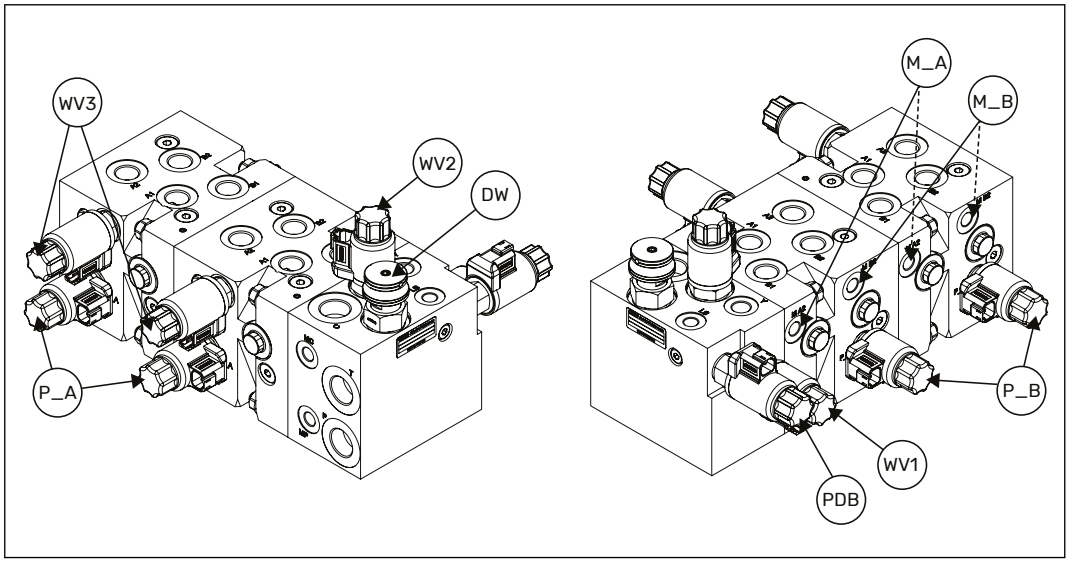


Figure 15. CVM120 4WD valve, locations of the valve connections.

8.6 CVU200 valve

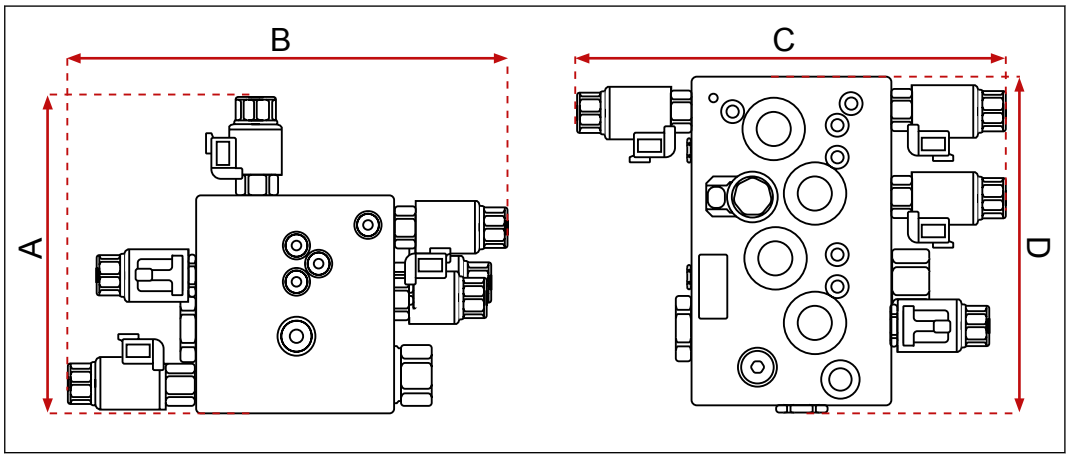


Figure 16. CVU200 valve, main dimensions.

Order code	CVU200-A1H0T0V12S00
External dimensions (A x B) External dimensions (C x D)	228 mm x 315 mm 315 mm x 240 mm
Maximum pressure level	350 bar
Maximum flow rate	200 l/min
Operating voltage	12 V DC
Compatible pump	Load-sensing (LS), external LS interface (Power Beyound).

More detailed technical information and dimensions; see the datasheet of the valve.

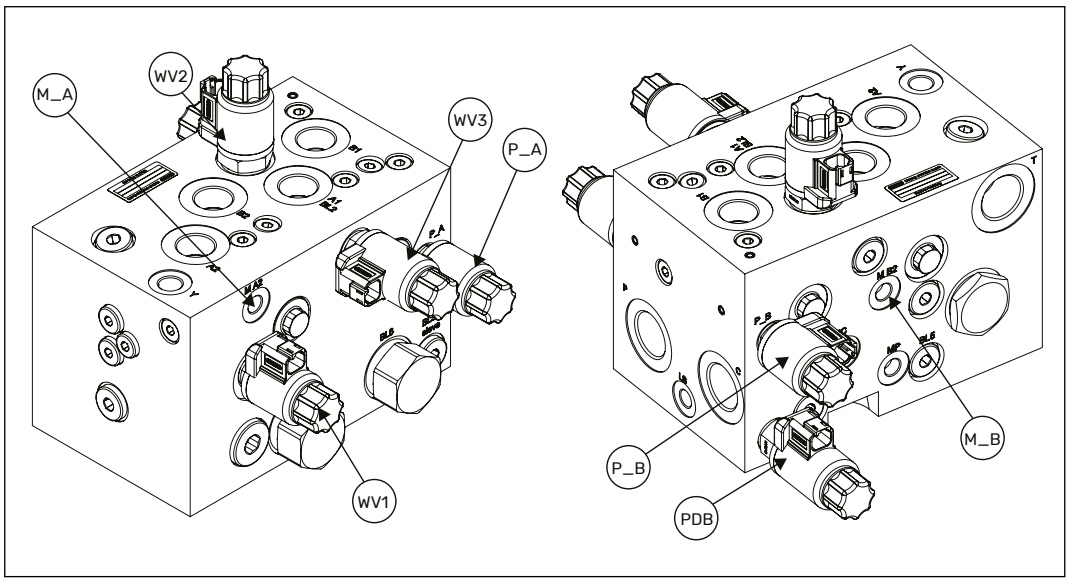


Figure 17. CVU200, locations of the valve connections.

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