

ELECTRICS— TRAINING BW 154 AP- 4 BW 174 AP- 4

- Version 1.01 -



P/N 008 097 67

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2 Confirmation of changes

2.1 Document

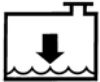
No.	Date	Description of changes	resp.
1.00	28.02.2010	Creation of version 1.00	Fondel

2.2 Software

Ver.	Date	Description of changes	resp.
1.00	xx.03.2010	First software for series production	Fondel

1. *Only the most important software changes are listed here. A detailed breakdown can be found in the corresponding software change report.

3 Displayed monitoring activities with fault reactions

Reaction Signal	Symbol in fault message display	Warning Code output <u>without</u> buzzer	Warning Code output <u>with</u> buzzer	Engine stop Code output <u>with</u> buzzer
Engine oil pressure			5020 after 5s	5021 after 10s
Coolant level			5024 after 5s	5025 after 10s
Engine air filter			5026 after 5s	
Water separator in fuel filter			5028 after 5s	
Coolant temperature 1			5030 after 5s 5031 after 10s (speed limited)	
Coolant temperature 2 (only with Kubota engines)			5032 after 5s	5033 after 10s
Hydraulic oil filter		5500 after 5s		5501 after 300s
Seat contact			1300	
Seat position			1310	
Arm rest, left			1320	

4 Known faults

Despite the fault monitoring of inputs and outputs on the ESX control, the ESX control is not able to detect all faults. The following list contains a selection of known fault reactions of the control, which mostly have a different cause to the one described in this documentation.

Effect:	Cause:	Remedy:
Display remains dark, no voltage	PIN in display plug X 28 bent	Check, repair plug

5 Place Holder

6 How to proceed when replacing components?

Each machine of the product family BW 154 and BW 170/174 is individually adjusted during initial commissioning. This adjustment or teaching process is necessary to make sure that the travel and steering functions are almost identical on all machines. Background of these adjustment procedures are the tolerances of the components used, e.g. hydraulic pump for travel system, proportional valves for steering, steering angle sensors and ESX control. These tolerances apply for both mechanical as well as electrical functions and are unavoidable for manufacturing reasons.

To enable simple and quick adjustment procedures we have decided to do without expensive tools. All you need is this manual. By following the described procedure it is possible to take a machine back into operation after the replacement of one of the components specified above and to re-establish the usual functional quality, with almost any previous knowledge. Even an incorrectly or incompletely conducted teaching procedure can be repeated without problems as often as necessary.

6.1 How to proceed when replacing an ESX control (A34)?

Since the control stores all teach values of the machine, each teaching procedure must be performed with the new control after a replacement.

Important: Before performing one of the following steps you may first need to adjust the respective machine type (see chapt. 7.3)!

However, if the correct machine type is displayed after initial start-up, you must skip this step.

When changing the machine type all previously made adjustments will be lost!

After changing a control on a machine, the fault code **7 0 1 3** may appear in the display. This fault indicates that the operating hour meter needs to be restored.

Please proceed as follows to restore the operating hour meter:

Enter code number **9 9 9 9** (activation of service mode)

Enter code number **8 8 8 7**. This code number activates the function "Release Memory Operation".

Enter code number **8 8 8 0**. This code number restores the value of the operating hour meter.

Successful completion is signalized with "**0 K**" or "**1 1 1 1**".

It is not possible to delete the operating hour meter or to set another value.

Depending on equipment state and manufacturing date of the machine it may be necessary to make all or some of the following adjustments in order to prepare the control:

Seat contact monitoring (see chapt. **Fehler! Verweisquelle konnte nicht gefunden werden.**)

Adjust the type of chip spreader (see chapt. 7.11)

Adjust the edge cutting unit (see chapt. 7.12)

For the performance of teaching procedures the following sequence has been found to be most effective:

Automatic detection of surge currents on steering valves (see chapt. 7.8)

Calibration of the angle transducers (see chapt. 7.4)

Automatic detection of surge currents in the travel system (see chapt. 7.9)

6.2 How to proceed when replacing a data collector module (A80)?

The data collector module requires teaching after replacement. The following sequence must thereby be followed:

The engine should not be running and the selector switch S 159 must be "Service" position.

1. Use code **9999** to change to "Service" mode
2. Enter code **8887** to release
3. Enter code **8889** to teach the module.
4. Restart the machine.

6.3 How to proceed when replacing a travel pump?

Automatic detection of surge currents in the travel system (see chapt. 7.9)

6.4 How to proceed when replacing a steering valve?

Automatic detection of surge currents on steering valves (see chapt. 7.8)

6.5 How to proceed when replacing a steering angle transducer?

Adjustment of the angle transducers (see chapt. 7.7)

Calibration of the angle transducers (see chapt. 7.4)

Note: Calibration of angle transducers must always be performed for both transom beds.

6.6 How to proceed when replacing a EGAS actuator?

Adjust the EGAS actuator (see chapt.7.4)

6.7 How to proceed when replacing a slope sensor?

Adjust the inclination sensor (see chapt. 7.5)

6.8 Which components can be replaced without a subsequent adjustment procedure?

Speed sensor

All switches in the dashboard

Travel lever (S 55)

BLM IO module (A 70)

Seat position switch (B 178, B 179)

Steering setpoint transmitter (A 45)

Vibration pump (Y 56, Y 57)

Vibration motors

Travel motors

Diesel engine

Steering cylinders, if the steering angle transducer has not been disassembled

Gear pumps for steering / charge system

Note: A final function test of the complete machine is highly recommended.

7 Functions of the ESX control

7.1 General display functions and operation

Apart from its normal display function the LC display is also able to show error codes, which had previously been visualized by means of the 3-digit error code display.

Currently existing faults and warnings are displayed by flashing. If several faults are detected, the displayed fault codes will change in a 3 second cycle.

Display values are permanently displayed, whereby values from **0 0 0 0 ... 9 9 9 9** are possible. Negative values are identified by a "Minus sign".

The following chapter describes the operation of the LC display via travel lever buttons.

7.1.1 Calling up service mode

For this purpose the display must be switched via input mode to service mode. This is accomplished via the **two yellow** Info-buttons "INFO 1" and "INFO 2" on the back of the travel lever. Navigation in input and service mode takes place via the green buttons on the front and the blue buttons on the back of the travel lever.



The travel lever must be in locked braking position in order to activate input mode! Input mode is switched on by simultaneously pressing both INFO – buttons over a period of approx. 3 seconds.

7.1.2 Entering input codes

Input mode starts with flashing of the left hand digit. Here service code **9 9 9 9** provides the possibility to change to the service mode. The green buttons can be used to increase or reduce the values of the corresponding digit. By operating one of the blue buttons one can jump to the next (left or right) digit. Once the last right hand digit has been entered the code will be transferred to the control by pressing the right hand blue button once again.

If the access code has been entered correctly, the "Spanner" symbol is displayed and the first input digit flashes again. Individual operating states of the machine can now be interrogated by transferring the input code to the control (as described above).

When operating both INFO buttons again for approx. 3 seconds, another input code can be entered. The input of code **"0 0 0 0"** or switching of the ignition quits the service mode.

If the travel lever is shifted out of the brake lock while in service mode, all machine functions will become active, with the exception of the LC-display, which remains in service mode and continues to display the operating values requested last.

7.2 Driving against the closed brake

In order to enable testing of the brake efficiency according to the relevant standard you should **not** pull off the valve plug off the brake valve on this machine, because the control would in this case detect a line interruption in the current path to the brake.

In order to conduct this test the code number **0 5 0 0** must be entered at the display module. After entering the code number the brake will not be released. If the travel lever is operated in this situation, the travel pump is operated in accordance with the selected travel direction.

At the same time the measurement actual current appears on the display.

In order to terminate this function and release the brake you must either enter code number **0 5 0 1** or switch the ignition off.

7.3 Setting the machine type

Since the same control can be used for all pivot steered tandem rollers, the machine type must be adjusted during the initial installation or in case of a replacement. This setting of the machine type is necessary, even though the functions of the machines are identical, but not the valves, hydraulic pumps, hydraulic motors etc. When adjusting the machine type all settings required for the respective machine type are made.

For easier control of the adjusted machine type the respective machine type appears in the display module for 3 seconds whenever the ignition is switched on. The following table shows the assignment of the various machine types to the machine codes.

The range of serial numbers must be strictly observed!

Machine type	First serial number	Last serial number	Machine type code
BW 154 AP	101 870 61 2001	101 870 61 xxxx	7320
BW 154 ACP	101 870 63 2001	101 870 63 xxxx	7321
BW 154 AP AM	101 870 60 2001	101 870 60 xxxx	7325
BW 154 ACP AM	101 870 62 2001	101 870 62 xxxx	7326
BW 174 AP	101 870 71 1001	101 870 71 1006	7350
BW 174 AP	101 870 71 1007	101 870 71 xxxx	7352
BW 174 AP AM	101 870 70 1001	101 870 70 1049	7355
BW 174 AP AM	101 870 70 1050	101 870 70 xxxx	7357

Do not operate a machine with incorrect type setting, because this could lead to unacceptably long braking distances and very abrupt movements!
After replacing a control always compare the machine type set on the control with the actual machine type and correct the setting, if required!



Note: Parameter adjustments can only be performed when the engine is not running!

Note: This function can only be activated / deactivated when the travel lever is locked in the brake gate. (→Input mode)

The following procedure must be used for initial start-up of a control:

The control has been installed into the machine.

Switch the ignition on. Approx. 4 seconds after switching on the word

C O D E will appear for 3 seconds. After this the display changes and shows code **7 3 0 0**.

Use the green Up or green Down keys to select the correct machine code from the list of codes. Confirm the selection with the Blue Right key on the rear.

After a period of approx. 7 seconds the adjusted machine code, e.g. **7 3 5 5** is displayed for approx. 3 seconds. The new parameters are loaded according to the machine type setting. **Do not switch the ignition off during this time!**

After this switch the ignition off and on again to accept the configuration.

After this the normal display will appear again.

The following applies for a correction of the machine type code after it has been set.

Enter code number **9 9 9 9** (activation of service mode)

Enter code number **7 0 1 0**. This code number activates the function "Adjusting machine type".

The display module now permanently shows the code **7 3 0 0**.

Select the machine code from the table above and confirm it with the blue Right key on the rear. After operating the key the control switches automatically off and on again.

Use the green Up or green Down keys to select the correct machine code from the list of codes.

After a period of approx. 7 seconds the adjusted machine code, e.g. **7 3 5 5** is displayed for approx. 3 seconds. The new parameters are loaded according to the machine type setting. **Do not switch the ignition off during this time!**

After this switch the ignition off and on again to accept the configuration.

After this the normal display will appear again.

Attention: A machine must not be operated with a wrong type setting, because in such a case the correct function of the control cannot be assured!

New controls are delivered with the default machine type setting **7 3 0 0**. This does not enable to drive or steer the machine. It only serves the purpose of commissioning.

7.4 Adjusting the EGAS actuator

The throttle actuator for the engine must be set to the correct end stops before initial start-up of the engine. This is necessary to ensure correct operation and to prevent possible damage.

The following steps must be taken **before** initial starting of the diesel engine:

First the mechanical setting of the threaded rod must be checked.

The following steps require that the ignition is switched on.

If necessary use code **9 9 9 9** to set the machine into "Service" mode

Enter code number **5 1 0 0** to adjust the EGAS actuator.

This triggers teaching of the idle speed position with CODE **5 1 0 1**. The value is only displayed after the code has been entered and should be within the range of the table below.

After a wait time of 5 s enter the CODE **5 1 0 2** in order to learn the full throttle position. After entering this code move the governor rod manually to full throttle position and hold it there for about 10 seconds. If the value is in the permissible range (see table) the actuator signalizes this after a short while by switching off the internal coupling. The actuator can now be released again. It is returned to idle speed position by spring force. The teaching procedure is concluded with CODE **5 1 0 3**.

The information code **5 2 0 9** goes out.

Use the selector switch Low/Eco/Max to check the function of the EGAS actuator. The engine can now be started.

Machine type	Idle speed value range	Full speed value range
BW 154 AP	10..310	500..800
BW 174 AP	150..450	600..900

7.5 Adjusting the slope sensor

In order to ensure correct functioning of the Eco mode the slope sensor must be correctly adjusted before initial start-up. For this purpose the machine must be parked on horizontal ground.

If necessary use code **9 9 9 9** to set the machine into "Service" mode

Enter code number **1 2 6 0** to display the inclination sensor value.

Now the inclination sensor must be mechanically adjusted, until the display shows the value "0". A tolerance of +/- 10 is permissible.

7.6 Calibration of angle transducers

For a correct performance of the steering the angle transducers on front and rear drum must be correctly calibrated. This calibration is only required during initial commissioning in the factory, after a service during which the angle transducers had to be disassembled or replaced, or after the replacement of the ESX control.

Calibration of angle transducers must be performed as follows:

The driver's seat must face towards the dashboard!

For the following steps the steering mode selector switch may be set to one of the steering modes „steering front“ or „steering rear“. If another steering mode is selected, the function "Calibration of angle transducer" will not be activated. If the function "Calibration of angle transducers" is active and a steering mode other than the ones specified above is selected, the function "Calibration ..." will be aborted! In this case the whole adjustment procedure must be repeated!

The machine must not be driven during the calibration process

If necessary use code **9 9 9 9** to set the machine into "Service" mode

Enter code number **2 0 1 0**. This code number is used to activate the function "Calibration of Angle Transducer"; the display will permanently show the value **2 0 1 0**. This code number **must** be entered to be able to perform the following steps.

Important: For the input of the corresponding position code, the travel lever must be engaged in the brake lock!

In order to steer to any position the travel lever must be shifted out of the brake lock.

Calibrating the front stops:

Steer the front drum against the left hand stop. Once the left hand stop of the front drum is reached enter code number **2 0 1 2**; the display then permanently shows the value **2 0 1 2**.

Steer the front drum against the right hand stop. Once the right hand stop of the front drum is reached enter code number **2 0 1 4**; the display then permanently shows the value **2 0 1 4**.

Calibrating the rear stops:

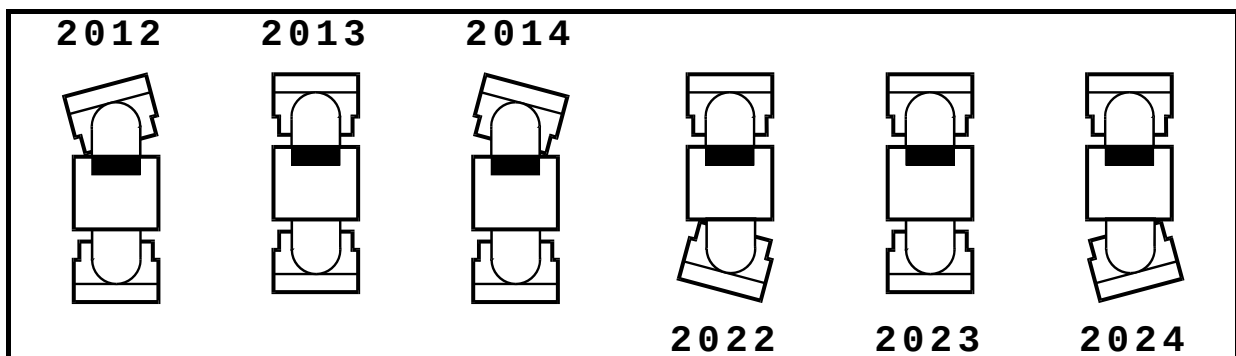
Steer the rear drum against the left hand stop. Once the left hand stop of the rear drum is reached enter code number **2 0 2 2**; the display then permanently shows the value **2 0 2 2**.

Steer the rear drum against the right hand stop. Once the right hand stop of the rear drum is reached enter code number **2 0 2 4**; the display then permanently shows the value **2 0 2 4**.

Calibrating the straight ahead position:

Steer the front drum to straight ahead position. Once the straight ahead position of the front drum is reached enter code number **2 0 1 3**; the display then permanently shows the value **2 0 1 3**.

Steer the rear drum to straight ahead position. Once the straight ahead position of the rear drum is reached enter code number **2 0 2 3**; the display then permanently shows the value **2 0 2 3**.



If a value outside the tolerance range of the respective position is calibrated, the value **9 9 9 9** will be output after entering the corresponding position code. Correction is possible.

Once all positions have been actuated and all codes have been entered the function „Calibration of angle sensors“ is automatically finished. The new values will only become valid after restarting the machine.

If the function "Calibration of angle transducers" is to be terminated prematurely, you must either enter code number **2 0 1 1** or switch the ignition off. In this case the whole adjustment procedure must be repeated!

Note: You must always calibrate both drums!
The new values will only become valid after restarting the machine!

7.7 Adjusting the angle transducers

For a correct performance of the steering position detection the angle transducers on front and rear drum must be correctly adjusted. This adjustment determines the position of the angle transducers to the transom bed. The angle transducers must only be adjusted during initial commissioning in the factory or after a service during which they were disassembled or replaced.

The adjustment of angle transducers is performed as follows:

Steer both drums to "straight ahead position". For this Step the angle transducers must already have been calibrated, as otherwise „straight ahead position“ cannot be reached. See also **Calibration of angle transducers** on page 13.

Note: In order to adjust both drums to straight ahead position switch off the crabwalk (green display goes out) and change from steering mode „front steering“ to „rear steering“ and back to „front steering“ **while** the machine is driving. You thereby utilize the automatic neutral setting of the drums when changing the steering mode. When switching over steering must be avoided and it must be assured that the automatic neutral setting of the drums has been performed. Then do not steer any more, stop the machine and shut the engine down.

For the following steps you **must shut the engine down** and switch the ignition off.

If necessary use code **9 9 9 9** to set the machine into "Service" mode

Enter code number **2 0 3 0** to adjust the front angle transducer. The displayed value should be **1 1 7 0 0** and **1 2 3 0 0**, the ideal value would be **1 2 0 0 0**. If the value is outside this range adjust the angle transducer. For this purpose loosen the fastening screws in the slots of the transducer and turn the angle transducer until the value is inside the required range. If the adjustment range in the slots is not big enough loosen and adjust also the coupling between transducer and transom bed. Once the angle transducer has been adjusted retighten all screws and check the display value again!

Enter code number **2 0 4 0** to adjust the rear angle transducer. The displayed value should be **1 1 7 0 0** and **1 2 3 0 0**, the ideal value would be **1 2 0 0 0**. If the value is outside this range adjust the angle transducer. For description of the adjustment procedure refer to the previous item.

After the adjustment of one or both angle transducers, the angle transducers **must** be calibrated again. See also **Calibration of angle transducers** on page 13.

Note: Even if only one of the angle transducers both transducers must be calibrated again!
Siehe hierzu Kap. 7.4

7.8 Automatic detection of surge currents on steering valves

To enable a sensitive and exact function of the steering the surge currents of the four control solenoids and both steering valves must be measured. The surge currents are automatically adjusted after entering a code number, so that no electric meter is required.

The surge currents must only be adjusted during initial commissioning in the factory, after a service during which the control on a steering valve or the complete steering valve has been replaced and after the replacement of the ESX-control.

The measurement is identical for all four solenoids:

Example BW 174 AP

After entering the respective code numbers the current is increased by the control solenoid in steps of 5 mA, starting from 750 mA.. After each increasing step the system waits for 2 seconds. If a change in drum angle is measured after the waiting time, the surge current is reached. In order to enhance the measuring result this measurement is performed three times. The final surge current is the mean value of these three measurements. This surge current is automatically stored and is valid from the next start of the machine.

For all other machine types the same procedure is used, however, currents and times will vary.

Before the measurement you must strictly make sure that the steering system is „bled“, because an air cushion in the steering cylinders would have a negative effect on the measurement and therefore on the steering performance of the machine. Sufficient bleeding is achieved by performing a few quick steering movements at full engine speed.

The automatic measurement of the steering valve surge currents is performed as follows:

The brake must be released!

The engine must run with full speed!

If necessary use code **9 9 9 9** to set the machine into "Service" mode

Enter code number **2 0 0 0**. This code number is used to activate the function "Automatic

Measurement of Steering Valve Surge Currents"; the display then prompts you to enter the start code.

Code no. **2 0 0 1** starts the automatic detection of surge currents.

Front and rear surge currents are detected successively.

During the measurement the actual current is displayed (display value in mA).

Attention! During the measurement the respective drum cannot be steered !

Do not drive while the measurement is progressing !

Once the measurement is completed the display will show the value **0 K** or **11111** for 5 seconds, followed by the code number **0 0 0 0**. Once the four surge currents have been measured, the machine must be shut down in order to switch off the function "Automatic measurement of steering valve surge currents". The new surge current values are valid from the next start.

Note: **During the measurement the machine should be parked on level ground.**
 Before the measurement both drums should be steered to straight ahead position.

7.9 Automatic detection of surge currents in travel system

For a sensitive and exact function of the travel system the surge currents in the travel system must be determined for both travel directions. The surge currents are automatically determined after entering a code number, so that no electric meter is required.

The surge currents must only be determined during initial commissioning in the factory, after a service during which the control on a steering valve or the complete steering valve has been replaced and after the replacement of the ESX-control.

The measurement is identical for both travel directions: After entering the respective code number the current is increased by the control solenoid on the travel pump in steps of 5 mA, starting from 250mA.. After each current increase the system waits for 3 seconds. If a considerable drum movement is measured during the waiting time, the surge current is reached. In order to enhance the measuring result this measurement is performed three times. The final surge current is the mean value of these three measurements. This surge current is automatically stored and is valid from the next start of the machine.

Before the measurement you should strictly make sure that the machine is parked on level ground and has a sufficient distance for movement to front and back, because the machine will move to the respective direction when performing the measurement.

Attention! First set the machine to input mode (code **9999**). It must be strictly assured that the speed sensor (in front right hand hydraulic motor) is working correctly. For a function test enter code number **1106** at the display module. This code can be used to display the number path pulses from the speed sensor. The displayed value must change when the machine is driven.

If this value does not change even though the machine is moving, the measurement must not be performed!

The state of the speed sensor must first be corrected, as otherwise the movement of the drum will not be detected. (See also: „Resetting the surge currents in the travel system“)

Attention!

During the measurement the machine will move when the surge current is reached!

Do not leave the machine while the measurement is progressing!

During the measurement keep an eye on your environment!

To stop the machine reset the travel lever to neutral position!

The automatic measurement of the travel system surge currents is performed as follows:

The speed selection switch **must be** in position ECO.

If necessary enter code number **9999** to access the service mode.

Then enter **1090**. This code number activates the function "Automatic detection of surge currents in the travel system"; the display now shows the reading **0000** with the first digit flashing. This code number **must** be entered to be able to perform the following steps. **From this point the machine can no longer be operated with the travel lever! The travel lever will only be in function again after the teach function has been completed or the machine has been restarted.**

The measurements (forward/reverse) must be started by entering a code number. The code number required to teach the travel direction is as follows:

Determination of control surge currents	1 0 9 1
---	---------

After the input of the above code number the display shows "F 0 R W" or "4 4 4 4 4". Shifting the travel lever forward starts the first surge current measurement for forward travel.

During the measurement the actual current is displayed (display value = current in mA).

Once the surge current measurement is finished the display will show the reading **0 K** or **"1 1 1 1 1"** for a period of 5 seconds.

After this wait time the display reading changes to **"B A C K"** or **"5 5 5 5 5 "**. Now shift the travel lever backward to start the surge current measurement in reverse.

During the measurement the actual current is displayed (display value = current in mA).

Once the measurement is finished the display will show again **"0 K"** or **"1 1 1 1 1"**.

The travel lever must now be returned to braking position.

Once both surge currents have been learned correctly and the travel lever is in "braking position", the display shows the reading **"D O N E"** or **"3 3 3 3 3 "**, the values are saved and the function is completed. Now the machine can be operated again with the travel lever. The new surge current values for the travel system are valid from the next start.

The teach function can at any time be aborted by operation of the emergency stop or the ignition switch.

7.10 Fault log – display and delete

7.10.1 Showing stored faults

This function is only valid from software version 1.10!

Switch on function "Show stored faults":

Enter code number **0 7 0 0** (**! WITHOUT** service code **9 9 9 9**). This code number enables the function „Show stored faults“.

The faults stored in the ESX are displayed in flashing mode. If several faults are stored, these are successively displayed in cycles of 3 second. After the last fault has been displayed, the first fault will appear again. If no faults are stored in the ESX, the display will show "-----"

Switch off function "Show stored faults":

Enter code number **0 7 0 1** (**! WITHOUT** service code **9 9 9 9**). This code number disables the function „Show stored faults“.

Note: Apart from the stored faults the current faults are also displayed.

Note: This function can only be activated / deactivated when the travel lever is locked in the brake gate. (→ Input mode)

7.10.2 Delete all stored faults

Execute the function „Delete all stored faults“:

The engine must not be running!

Enter code number **0 7 1 0** (**! WITHOUT** service code **9999**).

Switch the ignition off and on again.

All stored faults are now deleted.

Note: The stored faults can only be deleted when the engine is not running.

Note: This function can only be activated / deactivated when the travel lever is locked in the brake gate. (→ Input mode)

7.11 Adjusting the chip spreader type

BOMAG offers chip spreaders for pivot steered rollers:

Spreading beam type chip spreader.

For comfortable control of the spreading beam type chip spreader (precision spreader) developed by BOMAG the control must be adjusted accordingly. This adjustment then enables activation and deactivation of the spreading process with the vibration push button (red button) in the travel lever. Another switch for the change-over between vibration and chip spreader operation, which has to be actuated accordingly, is available (in the dashboard) This switch is also assessed by the control, in order to detect the operating mode.

BW 154/170 family / drive of chip spreader by vibration pump:

Since the chip spreader is on this machines driven by the vibration pump, the machine cannot be used with vibration when working in chip spreading mode.

Activating the spreading beam type chip spreader:

Enter code number **3 1 4 2** . This code number is used to activate the function "Setting the Chip Spreader Type"; the display will permanently show the value **0 0 0 0** . This code number **must** be entered to be able to perform the following step.

Enter code number **3 1 4 4** to activate the spreading beam type chip spreader. The indicator light goes out.

If the chip spreader functions is to be deactivated again, please enter code **3 1 4 3**

If the chip spreader is laterally slidable, this feature must also be adjusted. This requires input of code **3 1 5 2** .

Switch off the ignition of the machine. The spreading beam type chip spreader will become active during the next start; function as described above.

Note: **During the input the diesel engine of the machine should not be running!**
 Any change to the setting of the chip spreader type will only become effective after switching the ignition off and back on again!

7.12 Activating edge cutting units

For pivot steered rollers BOMAG offers edge cutting units at the following positions:

Without
Front right only
rear left only
Front and rear

For correct controlling of the edge cutting units the control must be set accordingly. With these settings it is then possible to move the edge cutter up and down with the joystick buttons. Another switch for the change-over between vibration and chip spreader operation, which has to be actuated accordingly, is available (in the right arm rest) This switch is also assessed by the control, in order to detect the operating mode. The edge cutters can only be moved in vibration operation. If the machine is equipped with two edge cutters, the edge cutter to be moved must first be selected with an additional selector switch. The up or down movement is then controlled with the up/down buttons (green) on the joystick.

Activating the edge cutter:

Enter code number **3 1 3 1** . This code number is used to activate the function "Setting the Edge Cutter"; the display will permanently show the value **0 0 0 0** . This code number **must** be entered to be able to perform the following step.

Edge cutter at front only Code **3 1 3 3**

Edge cutter at front and rear Code **3 1 3 4**

Edge cutter at rear only Code **3 1 3 5**

Switch off the ignition of the machine. The edge cutters will become active during the next start; function as described above.

Note: **During the input the diesel engine of the machine should not be running!**
 Any change to the setting of the edge cutting units will only become effective after switching the ignition off and back on again!

8 Description of Signals on the Electronic Modules

8.1 Description of the signals on the ESX-control

Notes:

- Wherever the value of 12V is mentioned in the following text, it refers to the current battery voltage under due consideration of voltage drops in the lines.

ESX terminal	Signal description	Nominal values (voltage / current)
X35:1	AGND = Analogue ground: Ground potential for analogue signals (travel lever, speed range selector, steering mode switch, angle transducers ...)	Approx. 0 V measured against ground (Pot 31)
X35:2	---	---
X35:3	Output warning buzzer Digital output (max. 2,5 A)	Warning buzzer active ⚡ approx. 12 V Warning buzzer inactive ⚡ 0 V
X35:4	Interface RS232 RXD , not used for normal operation. Communication interface for parameter changes	Measurement not possible!
X35:5	Interface RS232 TXD , not used for normal operation. Communication interface for parameter changes	Measurement not possible!
X35:6	<i>Analog input Asphalt Temperature Sensor</i>	<i>Currently not used</i>
X35:7	Input Seat position confirmation switch	Switch for seat position Voltage measured against ground Position „front“ ⚡ approx. 0V Position "rear" ⚡ approx. 5V
X35:8	Input steering mode selector switch (5 stages) Analogue input / voltage input 0---8.5V	Position steering mode switch Voltage measured against AGND Synchronized steering ⚡ 6.4---7.8V Automatic steering ⚡ 5.1---6.2V Steering front ⚡ 3.8---4.7V Steering rear ⚡ 2.5---3.1V Diagonal steering ⚡ 1.3---1.6V
X35:9	Input Crabwalk selector switch (24 stages) Analogue input / voltage input 0---8.5V	Position crabwalk switch Voltage measured against AGND left hand stop ⚡ 7.4---8.9V Neutral position ⚡ 4.0---4,8V right hand stop ⚡ 0.3---0.4V
X35:10	---	---

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ESX terminal	Signal description	Nominal values (voltage / current)
X35:11	Output control light seat position confirmation switch	Proximity switch for seat position and switch for seat position show identical seat position ☞ approx. 0V measured against ground Proximity switch for seat position and switch for seat position do not show the same seat position ☞ output voltage changes between approx. 0V and approx. 12V, measured against ground
X35:12	Input drum speed sensor (travel system)	Signal changes between approx. 0V and approx. 5V, when machine is driving.
X35:13	Input arm rest left	Arm rest bottom position ☞ 0 V Arm rest up ☞ > 0,5 V
X35:14	Input BTS brake (from travel lever) Digital input active high	Brake released ☞ approx. 12 V Brake applied ☞ 0 V
X35:15	Input seat contact switch Digital input active high	Seat operated ☞ 0 V Seat not operated ☞ > 0,5 V
X35:16	Input Diesel engine speed sensor Digital input active low	BW 170/174 with speedometer ☞ frequency between approx. 2kHz at 800 rpm and approx. 7.5kHz at 2600 rpm
X35:17	---	---
X35:18	Input sensor bearing 1 track 1 Digital input active low This signal is used to detect the rotary movement of the steering wheel. When turning the steering wheel slowly one can measure the digital signals.	Condition 1 ☞ approx: 5V measured against AGND Condition 0 ☞ approx: 0V measured against AGND
X35:19	Input sensor bearing 1 track 2 Digital input active low This signal is used to detect the rotary movement of the steering wheel. When turning the steering wheel slowly one can measure the digital signals.	Condition 1 ☞ approx: 5V measured against AGND Condition 0 ☞ approx: 0V measured against AGND
X35:20	Output travel pump forward PWM digital output (max. 4A)	Permissible current range: approx. 0.35A---1.6A, when driving in this direction, otherwise 0A
X35:21	Output travel pumps reverse PWM digital output (max. 4A)	Permissible current range: approx. 0.35A---1.6A, when driving in this direction, otherwise 0A
X35:22	---	---

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ESX terminal	Signal description	Nominal values (voltage / current)
X35:23	Voltage supply for sensors This output supplies steering angle sensor and steering unit. Without this voltage the control cannot work correctly and will switch to override mode (emergency function).	Nominal voltage = 8.5 V Permissible range: approx. 7.65---9.35 V This voltage must be measured against AGND.
X35:24	Output amplitude changeover Digital output (max. 2,5 A)	Active, i.e. high amplitude ≈ approx. 12 V Inactive, i.e. low amplitude ≈ 0 V
X35:25	Output water pump left/front	Pump running ≈ approx. 12 V Pump not running ≈ 0 V
X35:26	Interface CAN-Bus 1 Wire - , is used for communication with MESX, data collector, LCD-display and BOP.	Measurement not possible!
X35:27	Interface CAN-Bus 1 Wire + , is used for communication with MESX, data collector, LCD-display and BOP.	Measurement not possible!
X35:28	Input D+	Here 12 V must be applied to be able to switch on the control!
X35:29	Input steering angle, front Analogue input / current input 0---20 mA	Right hand stop ≈ 4---8 mA Left hand stop ≈ 16---20 mA Straight ahead ≈ 10---14 mA
X35:30	Input steering angle, rear Analogue input / current input 0---20 mA	Left hand stop ≈ 4---8 mA Right hand stop ≈ 16---20 mA Straight ahead ≈ 10---14 mA
X35:31	Input lift magnet monitoring	
X35:32	---	---
X35:33	Interface CAN-Bus 2 Wire - , is used to communicate with the travel lever.	Measurement not possible!
X35:34	---	---
X35:35	---	---
X35:36	Input hydraulic oil filter pressure differential switch Digital input active low	Pressure switch for hydraulic oil Closed ≈ approx. 0V Open ≈ approx. 12V
X35:37	---	---
X35:38	Input seat position switch 1 (inside)	Switch detects metal ≈ approx. 12V Switch does not detect metal ≈ approx. 0 V
X35:39	Input seat position switch 2 (outside)	Switch detects metal ≈ approx. 12V Switch does not detect metal ≈ approx. 0 V

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ESX terminal	Signal description	Nominal values (voltage / current)
X35:40	Input sensor bearing 2 track 1 Digital input active low This signal is used to detect the rotary movement of the steering wheel. When turning the steering wheel slowly one can measure the digital signals.	Condition 1 approx: 5V measured against AGND Condition 0 approx: 0V measured against AGND
X35:41	Input sensor bearing 2 track 2 Digital input active low This signal is used to detect the rotary movement of the steering wheel. When turning the steering wheel slowly one can measure the digital signals.	Condition 1 approx: 5V measured against AGND Condition 0 approx: 0V measured against AGND
X35:42	Output vibration pump PWM Signal	Off approx. 0V On approx. 12V
X35:43	---	---
X35:44	---	---
X35:45	Output engine shut down relay	Engine shut-down approx.12 V Engine still running or not yet started 0 V
X35:46	Output steering valve front left PWM digital output (max. 4A)	Permissible current range: approx. 0---1.8A
X35:47	Output steering valve front right PWM digital output (max. 4A)	Permissible current range: approx. 0---1.8A
X35:48	Output steering valve rear left PWM digital output (max. 4A)	Permissible current range: approx. 0---1.8A
X35:49	Output steering valve rear right PWM digital output (max. 4A)	Permissible current range: approx. 0---1.8A
X35:50	Output Valve vibration front off	Vib front on approx. 0V Vib front off approx. 12V
X35:51	Output Valve vibration rear off	Vib rear on approx. 0V Vib rear off approx. 12V
X35:52	<i>Fault signal output (only for development purposes)</i>	---
X35:53	Interface CAN-Bus 2 Wire +, is used to communicate with the travel lever.	Measurement not possible!
X35:54	Voltage supply for electronics (permanent voltage)	Control running approx. 12 V Control not running 0 V
X35:55	Ground connection electronics	Approx. 0 V measured against ground
X35:56	Voltage supply for outputs (permanent voltage)	Approx. 12V measured against ground

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ESX terminal	Signal description	Nominal values (voltage / current)
X35:57	Voltage supply for outputs (permanent voltage)	Approx. 12V measured against ground
X35:58	Voltage supply for outputs (permanent voltage)	Approx. 12V measured against ground
X35:59	Voltage supply for outputs (permanent voltage)	Approx. 12V measured against ground
X35:60	Voltage supply for outputs (permanent voltage)	Approx. 12V measured against ground
X35:61	Output brake valve	Brake released ⚡ approx. 12V Brake applied ⚡ 0 V
X35:62	Output Water pump right	Pump running ⚡ approx.12 V Pump not running ⚡ 0 V
X35:63	---	---
X35:64	Output Lift magnet for engine speed control	High speed ⚡ approx.12 V Low speed ⚡ 0 V
X35:65	Ground connection	approx. 0 V
X35:66	Ground connection	approx. 0 V
X35:67	Ground connection	approx. 0 V
X35:68	Ground connection	approx. 0 V

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8.2 Description of signals on the data collector

Notes:

Wherever the value of 12 V is mentioned in the following text, it refers to the current battery voltage under due consideration of voltage drops in the lines.

PIN data collector	Signal description	Nominal values (voltage / current)	
X26:1 grey	Input indicator right Digital input active high	Indicator right active	☞ approx. 12 V
		Indicator right inactive	☞ 0 V
X26:2 grey	Input indicator left Digital input active high	Indicator left active	☞ approx. 12 V
		Indicator left inactive	☞ 0 V
X26:3 grey	Input engine running (D+) Digital input active high	Engine running	☞ approx. 12 V
		Engine not running	☞ 0 V
X26:4 grey	Input engine air filter Digital input active low	Filter clogged	☞ 0 V
		Filter OK	☞ ? V
X26:5 grey	Input coolant supply Digital input active low	Coolant supply too low	☞ 0 V
		Sufficient coolant supply	☞ ? V
X26:6 grey	Input excessive engine temperature switch 1 Digital input active low	Temperature exceeded (switched)	☞ 0 V
		Temperature OK	☞ ? V
X26:7 grey	Input engine oil pressure switch Digital input active low	Oil pressure OK	☞ 0 V
		No oil pressure	☞ ? V
X26:8 grey	Input engine preheating active Digital input active high	Preheating off	☞ 0 V
		Preheating active	☞ 12 V
X26:9 grey	Input water tank low level left Digital input low high (normally closed)	Water level above minimum	☞ 0 V
		Water level below minimum	☞ ? V
X26:10 grey	Input water tank low level right Digital input low high (normally closed)	Water level above minimum	☞ 0 V
		Water level below minimum	☞ ? V

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PIN data collector	Signal description	Nominal values (voltage / current)
X26:11 grey	Input excessive engine temperature switch 2 Digital input active low	Temperature exceeded (switched) ⚡ 0 V Temperature OK ⚡ ? V
X26:12 grey	Ground connection	0V (measured against ground)
X27:1 black	Input water level (only BW 154) Analog input (current)	4 – 20 mA = valid range
X27:2 black	Input fuel level Analog input	The voltage signal changes with the filling level in the fuel tank Fuel tank empty ⚡ ?? V Fuel tank full ⚡ ?? V
X27:3 black	Not used	---
X27:4 black	Voltage supply for monitoring of water separation (PIN X27:9)	Voltage supply O.K. ⚡ approx. 12 V No voltage supply ⚡ 0 V
X27:5 black	Ground connection	0V (measured against ground)
X27:6 black	Interface CAN-Bus 1 Wire +, is used for communication with MESX, ESX, LCD-display and BOP.	Measurement not possible!
X27:7 black	Interface CAN-Bus 1 Wire -, is used for communication with MESX, ESX, LCD-display and BOP.	Measurement not possible!
X27:8 black	Voltage supply (permanent voltage)	Control running ⚡ approx. 12 V Control not running ⚡ 0 V
X27:9 black	Input water separation Current input	If a sufficient amount of water has been separated, a low current flows over the over the contacts and the water in the separator bowl. This input analyses this current. No water separated ⚡ I= 0A Water separated ⚡ I= 0.03mA
X27:10 black	Input hydraulic oil temperature (currently not used)	---

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PIN data collector	Signal description	Nominal values (voltage / current)
X27:11 black	Input water level (only BW 174) Analog input (resistance) This input is switched between R 14 (left tank) and R 15 (right tank) via relay K 23.	
X27:12 black	Not used	---

Service Training BW 154/174-4 AP**8.3 Description of signals on the travel lever**

Notes:

Wherever the value of 12 V is mentioned in the following text, it refers to the current battery voltage under due consideration of voltage drops in the lines.

PIN □travel lever	Signal description	Nominal values (voltage / current)
X23:1	Voltage supply (permanent voltage)	Electronics functioning ⚡ approx. 12 V Electronics not working ⚡ 0 V
X23:2	Ground connection	0V (measured against ground)
X23:3	Output BTS brake Digital output (max. 4 A)	Brake opens ⚡ approx. 12 V Brake closes ⚡ 0 V
X23:4	Output BTS (not used) Digital output (max. 4 A)	
X23:5	Output voltage supply for additional analog evaluations This output supplies the 24-stage travel range selector switch. This voltage is required to connect and evaluate further analog switches to the travel lever.	Nominal voltage = approx. 5.0 V Permissible range: approx. 4.8 - 5.2 V This voltage must be measured against AGND.
X23:6	Interface CAN-Bus 2 Wire + , is used to communicate with ESX and engine EMR.	Measurement not possible!
X23:7	Interface CAN-Bus 2 Wire - , is used to communicate with ESX and engine EMR.	Measurement not possible!
X23:8	AGND = Analogue ground: Ground potential for additional analog evaluations Reference to PIN X23:5	approx. 0 V measured against ground (terminal 31)
X23:9	Node address addressing 1	Connection to machine ground (0V)
X23:10	Node address addressing 2	Connection to machine ground (0V)
X23:11	Input travel stage selector switch Analog input	The voltage signal changes with the adjusted travel speed range Travel stage min. ⚡ ?? V Travel stage max. ⚡ ?? V
X23:12	Not used	---
X24:1	Input low amplitude Digital input active high	Low amplitude active ⚡ approx. 12 V Low amplitude inactive ⚡ 0 V
X24:2	Input high amplitude Digital input active high	High amplitude active ⚡ approx. 12 V High amplitude inactive ⚡ 0 V

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PIN ☐ travel lever	Signal description	Nominal values (voltage / current)	
X24:3	Input selector switch vibration manual/automatic Digital input active high	Automatic active Manual operation	☞ approx. 12 V ☞ 0 V
X24:4	Input selector switch edge cutter front/rear Digital input active high	Rear eadge cutter active Front edge cutter active	☞ approx. 12 V ☞ 0 V
X24:5	Input selector switch edge cutter, vibration/ chip spreader/service mode Digital input active high	Edge cutter, vib. Service, chip spreader	☞ approx. 12 V ☞ 0 V
X24:6	Input selector switch edge cutter, vibration/ chip spreader/service mode Digital input active high	Chip spreader Service, edge cutter, vib.	☞ approx. 12 V ☞ 0 V
X24:7	Output voltage supply for additional digital evaluations This output supplies the amplitude selector switch. This voltage is required to connect and evaluate further digital switches to the travel lever.	Voltage supply active Voltage supply inactive	☞ approx. 12 V ☞ 0 V
X24:8	Output voltage supply ground potential In connection with PIN X24:7 this output enables the control of additional components (relays, displays etc.)	0V (measured against ground)	

Service Training BW 154/174-4 AP**8.4 Description of Signals on Display Modules**

Notes:

If 12 V is mentioned in the following text, it refers to the actual battery voltage.

X28 and X 29 -> LCD Display or X32 -> round gauge are optionally used.

PIN Display	Signal description	Nominal values (voltage / current)	
X28:1 X32:26	Voltage supply (permanent voltage "ignition on")	Electronics functioning	☞ approx. 12 V
		Electronics not working	☞ 0 V
X28:2 X32:25	Ground connection	0V (measured against ground)	
X28:3 X32:21	Interface CAN-Bus 1 Wire + , is used for communication with MESX, ESX, data collector and BOP.	Measurement not possible!	
X28:4 X32:22	Interface CAN-Bus 1 Wire - , is used for communication with MESX, ESX, data collector and BOP.	Measurement not possible!	
X28:5 Only with LCD	Voltage supply (permanent voltage "Battery +" for RTC)	Electronics functioning	☞ approx. 12 V
		Electronics not working	☞ 0 V
X28:6 Only with LCD	Not used	---	
X29:1 X32:3	Input water sprinkling pump left Digital input active high	Pump left	☞ approx. 12 V
		Pump off	☞ 0 V
X29:2 X32:4	Input water sprinkling pump right Digital input active high	Pump right	☞ approx. 12 V
		Pump off	☞ 0 V
X29:3 X32:5	Input engine speed high idle Digital input active high	High idle active	☞ approx. 12 V
		High idle inactive	☞ 0 V
X29:4 X32:8	Input engine speed low idle Digital input active high	Low idle active	☞ approx. 12 V
		Low idle inactive	☞ 0 V
X29:5	Not used	---	
X29:6	Not used	---	
X29:7 X32:20	Output voltage supply for additional digital evaluations This output supplies the engine speed switch and the switch for frequency adjustment. This voltage is required to connect and evaluate further digital switches to the LCD.	Voltage supply active	☞ approx. 12 V
		Voltage supply inactive	☞ 0 V
X29:8	Not used	---	

8.5 Description of Signals on the BLM IO Module

BML terminal	Signal description	Nominal values (voltage / current)
X22:01	Supply, ground	
X22:02	Input address I	Must be applied to 12 V!
X22:03	Input address II	Must be applied to ground!
X22:04	Input address III	Must be applied to ground!
X22:05	Input not occupied	---
X22:06	Output backup alarm horn front	Horn on ☞ 12 V Horn off ☞ 0 V, no consumer connected 2.9 V
X22:07	Output backup alarm horn rear	Horn on ☞ 12 V Horn off ☞ 0 V, no consumer connected 2.9 V
X22:08	Output valve sprinkler system edge cutter front	Valve on ☞ 12 V Valve off ☞ 0 V, no consumer connected 2.9 V
X22:09	Output relay K78, emulsion pump	Relay on ☞ 12 V Relay off ☞ 0 V, no consumer connected 2.9 V
X22:10	Output hydraulic valve Y 20, edge cutter up	Valve on ☞ 12 V Valve off ☞ 0 V, no consumer connected 2.9 V
X22:11	Output hydraulic valve Y 21, edge cutter down	Valve on ☞ 12 V Valve off ☞ 0 V, no consumer connected 2.9 V
X22:12	Output hydraulic valves Y 124 and Y 48, edge cutter switch-over front/rear	Valves on ☞ 12 V Valves off ☞ 0 V, no consumer connected 2.9 V
X22:13	Output hydraulic valve Y 66, chip spreader operation	Valve on ☞ 12 V Valve off ☞ 0 V, no consumer connected 2.9 V
X22:14	Input voltage supply	12 V against ground
X22:15	Supply, ground	
X22:16	Serial interface RS 232 RxD	Measurement not possible!!
X22:17	Serial interface RS 232 TxD	Measurement not possible!!
X22:18	not used	---
X22:19	Output hydraulic valve Y 131, chip spreader up/left	Valve on ☞ 12 V Valve off ☞ 0 V, no consumer connected 2.9 V

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BML terminal	Signal description	Nominal values (voltage / current)
X22:20	Input, emulsion sprinkling on/off	
X22:21	Output hydraulic valve Y 67, chip spreader down/right	Valve on ☞ 12 V Valve off ☞ 0 V, no consumer connected 2.9 V
X22:22	Output hydraulic valve Y 192 and Y 193; change-over chip spreader adjustment	Valves on ☞ 12 V Valves off ☞ 0 V, no consumer connected 2.9 V
X22:23	Input emulsion sprinkling interval on/off	
X22:24	Output relay K 23, tank sensor change-over	Relay on ☞ 12 V Relay off ☞ 0 V, no consumer connected 2.9 V
X22:25	Input switch S36 drum pre-selection vibration, front	Vibration front only selected ☞ 12 V Otherwise ☞ 0 V
X22:26	Output valve Y 06 sprinkling pump left	Valves on ☞ 12 V Valves off ☞ 0 V, no consumer connected 2.9 V
X22:27	Input switch S36 drum pre-selection vibration, rear	Vibration rear only selected ☞ 12 V Otherwise ☞ 0 V
X22:28	Input voltage supply	12 V against ground
X22:29	Supply, ground	
X22:30	CAN - Bus, CAN -	Measurement not possible!
X22:31	CAN - Bus, CAN +	Measurement not possible!
X22:32	Serial interface RS 232 BSL	Measurement not possible!
X22:33	Output valve Y 91 sprinkling pump right	Valves on ☞ 12 V Valves off ☞ 0 V, no consumer connected 2.9 V
X22:34	Input switch S5 sprinkling pre-selection, drum and edge cutter	Sprinkling drum and edge cutter selected ☞ 12 V Otherwise ☞ 0 V
X22:35	Output valve Y 99 sprinkling edge cutter	Valve on ☞ 12 V Valve off ☞ 0 V, no consumer connected 2.9 V
X22:36	Output 16, not used	---
X22:37	Activation input, to switch on the module	Here ☞ 12 V must be applied, otherwise operation not possible.
X22:38	Output 17, not used	---
X22:39	Activation input, not used	---
X22:40	Output 18, not used	---
X22:41	Input switch S5 sprinkling pre-selection, edge cutter only	Sprinkling of edge cutter only selected ☞ 12 V Otherwise ☞ 0 V
X22:42	Input voltage supply	12 V against ground

9 Description of fault codes on the ESX control

9.1 Overview

Fault code	Fault description
0 0 0 0 - 0 9 9 9	General faults / warnings / machine tests
1 0 0 0 - 1 9 9 9	Fault in travel system
2 0 0 0 - 2 4 9 9	Fault in steering system
2 5 0 0 - 2 9 9 9	Fault in remote control
3 0 0 0 - 4 4 9 9	Faults in work functions (vibration, attachment plates, rotor, chip spreader, edge cutter or sprinkling system)
4 5 0 0 - 4 9 9 9	Fault in measuring systems
5 0 0 0 - 5 4 9 9	Fault diesel engine
5 5 0 0 - 5 9 9 9	Fault hydraulic system
6 0 0 0 - 6 9 9 9	Fault anti-theft warning system, localization system, access system, time account, etc.
7 0 0 0 - 7 4 9 9	Input of machine codes/
7 5 0 0 - 7 8 9 9	Input of codes for measuring technology
7 9 0 0 - 7 9 9 9	Operating hours, load spectrum, etc.
8 0 0 0 - 8 9 9 9	Severe software error ¹
9 0 0 0 - 9 9 9 9	Errors of external IO-nodes on one of the CAN-busses (joystick, data collector, Dios module, LC-display, BLM Module, engine control units, etc.) ¹

¹ These faults are only broken down partly hereunder!

9.2 Description of fault reactions

Fault reaction	Description of fault reaction
1	Warning. Fault code is displayed.
2	Warning. Fault code is displayed. Audible signal
3	Function affected , the faulty function is replaced by an emergency function. Fault code is displayed. Audible signal
4	Partial function faulty , the partial function cannot be overridden by an emergency function. The machine is stopped if this fault occurs. The machine can still be driven to a limited extent, but must be repaired by the service department as soon as possible. Fault code is displayed. Audible signal
5	Partial function faulty , the partial function cannot be overridden by an emergency function. ☞ the diesel engine is shut down. The machine is no longer able to drive, e.g. because parts of the travel system are defective Fault code is displayed. Audible signal
6	Severe fault. The function of the control can no longer be guaranteed. ☞ Control is switched off. ☞ the diesel engine is shut down, if possible. The fault code is displayed, the signal light in the monitoring board is permanently on. No audible signal!

Note: Errors with error reaction 1 and 2 are only warning messages and are NOT stored in the error log!

9.3 Note codes

Notes are a special form of fault messages.

The display shows note codes in the same way as fault codes, however, these do not require any service action, because they are just notes on particular operating states of the machine.

Note Code	Fault description	Possible causes	Input code for diagnose
1090	Travel pump valve surge currents Surge currents for travel pump have NOT been learned. See 7.9 Automatic detection of surge currents in travel system	The function "Teaching pump surge currents" for the travel pump has not yet been executed. → New machine/replacement of control	
2069	Valves steering pump surge currents Surge currents for steering pump have NOT been learned. See 7.8 Automatic detection of surge currents on steering valves	The function "Teaching surge currents" for the electric steering has not yet been executed. → New machine/replacement of control	
2199	Calibration of angle transducers Teaching of steering stops for electric steering NOT yet executed. See 7.4 Fehler! Kein gültiges Resultat für Tabelle.	The function "Teaching angle transducers" for the electric steering has not yet been executed. → New machine/replacement of control	
1300	Seat not occupied Machine does not pick up throttle and is braked to stop.	The driver has got up	
1310	Seat turned out of position Machine does not pick up throttle and is braked to stop.	The seat was turned and is in an impermissible position or the new position has not yet been confirmed	
1320	Arm rest raised Machine does not pick up throttle and is braked to stop.	The arm rest has been raised or the magnetic switch under the left hand arm rest is defective	
3100	Left hand water tank empty -> Switch over to the right tank or refill	The left pump is running, but the left tank is empty.	
3101	Right water tank empty -> Switch over to the left tank or refill	The right pump is running, but the right tank is empty.	
5013	Diesel engine stalled	various	

FaultLocation		Output brake valve Y04			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1004	The output was switched off because of too high temperature. As soon as the switch has cooled down the output will be switched on again.	X35:61	Excessive current in current path		5
1001	No or too low current flow out of this output	X35:61	Line breakage in current path Valve coil defective	1001	5
1002	Too high current flow out of this output Output was switched off!	X35:61	Short circuit to ground (31) in the current path Excessive current in current path		5
1003	Although the output is switched off, voltage is present	X35:61	Current path has connection to +Ub (15 or 30)	1001	5
FaultLocation		Input BTS brake			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1005	Plausibility conflict in evaluation of travel lever X- axis to the brake contact signal	X35:14	Line breakage in current path Current path has connection to +Ub (15 or 30) Software or hardware fault in travel lever, replacement	1005	5
FaultLocation		Output warning buzzer, H07			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1012	Although the output is switched off, voltage is present	X35:03	Current path has connection to +Ub (15 or 30)		3

1010	No or too low current flow out of this output	X35:03	Line breakage in current path	3
1011	Too high current flow out of this output Output was switched off!	X35:03	Short circuit to ground (31) in the current path Excessive current in current path	3

FaultLocation		Output backup warning (front), H114			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1016	Too high current flow out of this output Output was switched off!	X22:6	Short circuit to ground (31) in the current path Excessive current in current path		3
1017	Although the output is switched off, voltage is present	X22:6	Current path has connection to +Ub (15 or 30)		3
1015	No or too low current flow out of this output	X22:6	Line breakage in current path		3

FaultLocation		Output backup warning (rear), H14			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1020	No or too low current flow out of this output	X22:7	Line breakage in current path		3
1021	Too high current flow out of this output Output was switched off!	X22:7	Short circuit to ground (31) in the current path Excessive current in current path		3
1022	Although the output is switched off, voltage is present	X22:7	Current path has connection to +Ub (15 or 30)		3

FaultLocation		Travel lever, S55			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1032	Cable breakage Y-axis□Signal outside the valid range (see signal description)	CAN 2	Software or hardware fault in travel lever, replacement		3
1030	Software error X-axis□Software does not work correctly	CAN 2	Software or hardware fault in travel lever, replacement		3
1036	Software error Y-axis□Software does not work correctly	CAN 2	Software or hardware fault in travel lever, replacement		3
1027	Parameterization X-axis	CAN 2	Software or hardware fault in travel lever, replacement		3
1029	Differential error X-axis□Error in redundant evaluation of travel lever signal	CAN 2	Software or hardware fault in travel lever, replacement		3
1028	Direction evaluation X-axis□The direction of travel lever movement could not be determined	CAN 2	Software or hardware fault in travel lever, replacement		3
1025	Summarizing error X-axis□Error in redundant evaluation of axis	CAN 2	Software or hardware fault in travel lever, replacement		3
1034	Direction evaluation Y-axis□The direction of travel lever movement could not be determined	CAN 2	Software or hardware fault in travel lever, replacement		3
1033	Parameterization Y-axis	CAN 2	Software or hardware fault in travel lever, replacement		3
1035	Differential error Y-axis□Error in redundant evaluation of travel lever signal	CAN 2	Software or hardware fault in travel lever, replacement		3

1026	Cable breakage X-axis□Signal outside the valid range (see signal description)	CAN 2	Software or hardware fault in travel lever, replacement	3
1031	Summarizing error Y-axis□Error in redundant evaluation of axis	CAN 2	Software or hardware fault in travel lever, replacement	3

FaultLocation		Input travel stage selector switch S42			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1041	Supply connection□Signal outside the valid range	X23:5	Line breakage in current path	1040 1041 1042	2
1040	Ground Connection faulty□Signal outside the valid range	X23:8		1040 1041 1042	3

FaultLocation		Input travel stage selector switch, S42			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1042	Signal line□Signal outside the valid range	X23:11	Line breakage in current path	1040	3

FaultLocation		Output valve travel pump forward, Y16			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1079	Initialization error output	System	Software parameter fault, software update may be required ESX hardware defect, hardware replacement may be required		2

1077	Fault current regulator	X35:20	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	1070 1071	5
1071	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:20	Current path has connection to +Ub (15 or 30)	1070 1071	5
1070	The required control power cannot be transmitted to the proportional solenoid.	X35:20	Line breakage in current path	1070 1071	2
1076	Fault current regulator	X35:20	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	1070 1071	5
1075	Output to proportional valve shorted to ground.	X35:20	Short circuit to ground (31) in the current path Excessive current in current path	1070 1071	2
1074	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:20	Current path has connection to +Ub (15 or 30)	1070 1071	5
1073	The required control power cannot be transmitted to the proportional solenoid.	X35:20	Line breakage in current path		2
1072	Output to proportional valve shorted to ground.	X35:20	Excessive current in current path Short circuit to ground (31) in the current path	1070 1071	2

1078	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be	2
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FaultLocation		Output valve travel pump reverse, Y17			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1089	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be		2
1084	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:21	Current path has connection to +Ub (15 or 30)	1080 1081	5
1088	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be		2
1087	Fault current regulator	X35:21	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	1080 1081	5
1085	Output to proportional valve shorted to ground.	X35:21	Short circuit to ground (31) in the current path Excessive current in current path	1080 1081	2
1083	The required control power cannot be transmitted to the proportional solenoid.	X35:21	Line breakage in current path	1080 1081	2

1082	Output to proportional valve shorted to ground.	X35:21	Short circuit to ground (31) in the current path Excessive current in current path	1080 1081	2
1081	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:21	Current path has connection to +Ub (15 or 30)	1080 1081	5
1080	The required control power cannot be transmitted to the proportional solenoid.	X35:21	Line breakage in current path	1080 1081	2
1086	Fault current regulator	X35:21	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	1080 1081	5

FaultLocation		Teach function travel pump flow controller			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1091	Error in teaching the surge current forward The current limit was reached and the function terminated.	System	Drums: blocked		3
1090	Informative code - The teach function for the travel pump surge currents has NOT yet been successfully performed. Please follow the adjustment instructions	System	Informative code - Follow the adjustment instruction:		1
1092	Error in teaching the surge current reverse The current limit was reached and the function terminated	System	Drums: blocked		3
FaultLocation		Input speed sensor travel motor B60			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac

1105	No pulses from the speed sensor are detected, ven though the travel pump is actuated.	X35:12	Line breakage in current path Current path has connection to +Ub (15 or 30) Short circuit to ground (31) in the current path Hardware defect sensors, replacement required	3
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FaultLocation		Input inclination sensor, B57			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1261	Ground connection□Signal outside the valid range (see signal description)	X35:32	Line breakage in current path	1260 1262 1263 1264	3
1260	Supply connection□Signal outside the valid range (see signal description)	X35:32	No voltage supply (+Ub Pot 15 or 30) Line breakage in current path	1260 1262 1263 1264	3
FaultLocation		Input pressure sensor travel drive, B112			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1271	Signal range□The current signal is outside the valid range (see signal specification)	X35:6	Hardware defect sensors, replacement required	1270 1272 1273	3
1270	Signal fault□The current signal is not transferred	X35:6	Line breakage in current path	1270 1272 1273	3

1272	Pressure sensor does not measure any pressure	X35:6	Hydraulic problems	1270 1272 1273	3
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FaultLocation		Input seat contact switch, S06			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1300	Informative message, no fault! □ Driver's seat not occupied (driver not seated!) or cable breakage in signal line	X35:15	Line breakage in current path		0
FaultLocation		Detection of seat position			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1315	Plausibility error, signals from switches 1 and 2 not plausible	System	Line breakage in current path Hardware defect sensors, replacement required Sensors not correctly installed or not adjusted	1313 1314	2
1310	Informative message, no fault! □ Seat outside travel position, or seat position has not been confirmed with switch S 31.	System	Hardware defect sensors, replacement required	1312	0
FaultLocation		Input seat position switch 1, B178			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1311	Hardware defect, replace control	X35:38	ESX hardware defect, hardware replacement may be		2
1313	Cable breakage or sensor defective	X35:38	Line breakage in current path Hardware defect sensors, replacement required	1313	2

FaultLocation		Input seat position switch 2, B179			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1312	Hardware defect, replace control	X35:39	ESX hardware defect, hardware replacement may be		2
1314	Cable breakage or sensor defective	X35:39	Line breakage in current path Hardware defect sensors, replacement required	1314	2

FaultLocation		Arm rest, left			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1320	Informative message, no fault! ☐ Left arm rest raised. Machine does not pick up throttle and is braked to stop.	X35:13			0

FaultLocation		Input arm rest switch, B132			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
1323	System fault, replace control	X35:13	ESX hardware defect, hardware replacement may be		2
1321	Signal fault ☐ Signal outside the valid range	X35:13	Line breakage in current path Hardware defect sensors, replacement required	1320 1321	2
1322	Short circuit	X35:13	Excessive current in current path Current path has connection to +Ub (15 or 30) Short circuit to ground (31) in the current path	1320 1321	2

FaultLocation		Output steering valve Y92, front left steering			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac

2020	The required control power cannot be transmitted to the proportional solenoid.	X35:47	Valve coil defective Line breakage in current path	2
2021	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:47	Current path has connection to +Ub (15 or 30)	5
2024	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:47	Current path has connection to +Ub (15 or 30)	5
2025	Output to proportional valve shorted to ground.	X35:47	Short circuit to ground (31) in the current path Excessive current in current path	2
2026	Fault current regulator	X35:47	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	2
2022	Output to proportional valve shorted to ground.	X35:47	Short circuit to ground (31) in the current path Excessive current in current path	2
2029	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be	2
2023	The required control power cannot be transmitted to the proportional solenoid.	X35:47	Valve coil defective Line breakage in current path	2

2028	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be	2
2027	Fault current regulator	X35:47	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	2
FaultLocation Output steering valve Y93, front right steering				
FCode	FaultDescription	Terminal	Possible Cause	Diag Reac
2036	Fault current regulator	X35:46	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	2
2030	The required control power cannot be transmitted to the proportional solenoid.	X35:46	Valve coil defective Line breakage in current path	2
2035	Output to proportional valve shorted to ground.	X35:46	Short circuit to ground (31) in the current path Excessive current in current path	2
2038	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be	2

2033	The required control power cannot be transmitted to the proportional solenoid.	X35:46	Valve coil defective Line breakage in current path	2
2034	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:46	Current path has connection to +Ub (15 or 30)	5
2032	Output to proportional valve shorted to ground.	X35:46	Short circuit to ground (31) in the current path Excessive current in current path	2
2031	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:46	Current path has connection to +Ub (15 or 30)	5
2037	Fault current regulator	X35:46	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	2
2039	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be	2

FaultLocation		Output steering valve Y35, rear right steering			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2049	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be		2

2046	Fault current regulator	X35:49	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	2
2045	Output to proportional valve shorted to ground.	X35:49	Short circuit to ground (31) in the current path Excessive current in current path	2
2043	The required control power cannot be transmitted to the proportional solenoid.	X35:49	Valve coil defective Line breakage in current path	2
2042	Output to proportional valve shorted to ground.	X35:49	Short circuit to ground (31) in the current path Excessive current in current path	2
2041	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:49	Current path has connection to +Ub (15 or 30)	5
2040	The required control power cannot be transmitted to the proportional solenoid.	X35:49	Valve coil defective Line breakage in current path	2
2047	Fault current regulator	X35:49	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	2
2044	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:49	Current path has connection to +Ub (15 or 30)	5

2048	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be	2
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FaultLocation		Output steering valve Y36, rear left steering			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2059	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be		2
2051	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:48	Current path has connection to +Ub (15 or 30)		5
2058	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be		2
2054	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:48	Current path has connection to +Ub (15 or 30)		5
2056	Fault current regulator	X35:48	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec		2
2050	The required control power cannot be transmitted to the proportional solenoid.	X35:48	Valve coil defective Line breakage in current path		2

2053	The required control power cannot be transmitted to the proportional solenoid.	X35:48	Valve coil defective Line breakage in current path	2
2052	Output to proportional valve shorted to ground.	X35:48	Short circuit to ground (31) in the current path Excessive current in current path	2
2055	Output to proportional valve shorted to ground.	X35:48	Short circuit to ground (31) in the current path Excessive current in current path	2
2057	Fault current regulator	X35:48	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec	2

FaultLocation		Teach function surge current steering front right			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2065	Teach function aborted because current beyond the permissible limiting values.	System	Drums: blocked		2
FaultLocation		Teach function surge current steering front left			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2066	Teach function aborted because current beyond the permissible limiting values	System	Drums: blocked		2
FaultLocation		Teach function surge current steering rear right			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac

2067	Teach function aborted because current beyond the permissible limiting values	System	Drums: blocked	2
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FaultLocation		Teach function surge current steering rear left			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2068	Teach function aborted because current beyond the permissible limiting values	System	Drums: blocked		2

FaultLocation		Teach function steering valve surge currents			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2069	Informative code - The teach function for the steering valve surge currents has not yet been successfully performed. (see adjustment instructions)	System	Perform teach function steering valve surge currents Informative code - Follow the adjustment instruction:		1

FaultLocation		Steering wheel, A45			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2170	Plausibility of the sense of rotation does not match	X35:41	Hardware defect sensors, replacement required Pin 18 and 19 mixed up by mistake Pin 40 and 41 mixed up by mistake	2200	2

2179	Sensor 2 software error	System	ESX hardware defect, hardware replacement may be		2
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2172	Sensor 1 tracking fault □ The detected steering pulses on steering sensor 1 are outside the valid range □ (see signal description)	X35:18	Hardware defect sensors, replacement required Line breakage in current path	2210	2
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2178	Sensor 1 software error	System	ESX hardware defect, hardware replacement may be		2
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2177	Sensor 2 electronics error	System	ESX hardware defect, hardware replacement may be		2
2173	Sensor 2 tracking fault □ The detected steering pulses on steering sensor 2 are outside the valid range □ (see signal description)	X35:41	Line breakage in current path Hardware defect sensors, replacement required	2220	2
2175	Sensor 2 pulse error, sensor 2 delivers no or implausible values	X35:41	Plug X40 not plugged in No voltage supply (+Ub Pot 15 or 30) Hardware defect sensors, replacement required	2220 2221	2
2170	Plausibility of the sense of rotation does not match	X35:18	Hardware defect sensors, replacement required Pin 18 and 19 mixed up by mistake Pin 40 and 41 mixed up by mistake	2200	2
2174	Sensor 1 pulse error, sensor 1 delivers no or implausible values	X35:18	Plug X39 not plugged in No voltage supply (+Ub Pot 15 or 30) Hardware defect sensors, replacement required	2210 2211	2
2172	Sensor 1 tracking fault □ The detected steering pulses on steering sensor 1 are outside the valid range □ (see signal description)	X35:19	Hardware defect sensors, replacement required Line breakage in current path	2210	2
2174	Sensor 1 pulse error, sensor 1 delivers no or implausible values	X35:19	Plug X39 not plugged in No voltage supply (+Ub Pot 15 or 30) Hardware defect sensors, replacement required	2210 2211	2

2173	Sensor 2 tracking fault□The detected steering pulses on steering sensor 2 are outside the valid range □(see signal description)	X35:40	Line breakage in current path Hardware defect sensors, replacement required	2220	2
2175	Sensor 2 pulse error, sensor 2 delivers no or implausible values	X35:40	Plug X40 not plugged in No voltage supply (+Ub Pot 15 or 30) Hardware defect sensors, replacement required	2220 2221	2
2170	Plausibility of the sense of rotation does not match	X35:40	Hardware defect sensors, replacement required Pin 18 and 19 mixed up by mistake Pin 40 and 41 mixed up by mistake	2200	2
2176	Sensor 1 electronics error	System	ESX hardware defect, hardware replacement may be		2
2171				2200	2
2170	Plausibility of the sense of rotation does not match	X35:19	Hardware defect sensors, replacement required Pin 18 and 19 mixed up by mistake Pin 40 and 41 mixed up by mistake	2200	2

FaultLocation		Input steering mode selector switch, S89			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2181	Ground Connection of sensor/switch faulty□The voltage applied to the input is outside the specified range (see signal description).	X35:08	Line breakage in current path Hardware defect sensors, replacement required	2260 2262	2

2182	Supply connection Connection of sensor/switch faulty□The voltage applied to the input is outside the specified range (see signal description).	X35:08	Line breakage in current path Hardware defect sensors, replacement required	2260 2262	2
2183	Signal fault□Signal outside the valid range (see signal description)	X35:08	Hardware defect sensors, replacement required	2260 2262	3

FaultLocation		Input crabwalk selector switch, S33			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2187	Signal fault□Signal outside the valid range (see signal description)	X35:09	Hardware defect sensors, replacement required	2250 2252	3
2186	Supply connection Connection of sensor/switch faulty□The voltage applied to the input is outside the specified range (see signal description).	X35:09	Line breakage in current path Hardware defect sensors, replacement required No voltage supply (+Ub Pot 15 or 30)	2250 2252	2
2185	Ground Connection of sensor/switch faulty□The voltage applied to the input is outside the specified range (see signal description).	X35:09	Line breakage in current path Hardware defect sensors, replacement required	2250 2252	2

FaultLocation		Input steering angle sensor front, B65			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2191	Signal fault□Signal outside the valid range (see signal description)	X35:29	Line breakage in current path Hardware defect sensors, replacement required	2030	2

2192	Short circuit towards Ub	X35:29	Current path has connection to +Ub (15 or 30)	2030	2
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2190	Hardware initializing error	System	ESX hardware defect, hardware replacement may be		2
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FaultLocation		Steering angle sensor front, B65			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2193	Teach values from memory not within the permissible range.	System	Repeat teach function for steering angle	2033 2034 2035	2

FaultLocation		Steering angle sensor rear, B66			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2194	Teach values from memory not within the permissible range.	System	Repeat teach function for steering angle	2043 2044 2045	2

FaultLocation		Input rear steering angle sensor, B66			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2197	Short circuit towards Ub	X35:30	Current path has connection to +Ub (15 or 30)	2040	2

2196	Signal fault□Signal outside the valid range (see signal description)	X35:30	Line breakage in current path Hardware defect sensors, replacement required	2040	2
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2195	Hardware initializing error	System	ESX hardware defect, hardware replacement may be		2
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FaultLocation		Steering angle teach function			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2198	For teaching the steering angles the driver's seat must be directed towards the front drum!	System	Informative code - Follow the adjustment instruction:		3
2199	Informative code - The teach function for the steering angles has not yet been successfully performed. (see adjustment instructions)	System	Informative code - Follow the adjustment instruction:		1
FaultLocation		Steering direction monitoring			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
2203	The rear right hand output is triggered, however, the drums steers to the left or does not steer at all.	System	Drums: blocked Hardware defect sensors, replacement required Hydraulic problems	2203 2203	2
2200	The front left hand output is triggered, however, the drums steers to the right or does not steer at all.	System	Drums: blocked Hardware defect sensors, replacement required Hydraulic problems		2
2201	The front right hand output is triggered, however, the drums steers to the right or does not steer at all.	System	Drums: blocked Hardware defect sensors, replacement required Hydraulic problems		2
2202	The rear left hand output is triggered, however, the drums steers to the right or does not steer at all.	System	Drums: blocked Hardware defect sensors, replacement required Hydraulic problems	2202	2

FaultLocation		Output vibration pump, low amplitude, Y56			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3000	The required control power cannot be transmitted to the proportional solenoid.	X35:42	Line breakage in current path Valve coil defective	3021 3022	2
3005	Output to proportional valve shorted to ground.	X35:42	Short circuit to ground (31) in the current path Excessive current in current path	3021 3022	2
3003	The required control power cannot be transmitted to the proportional solenoid.	X35:42	Line breakage in current path Valve coil defective	3021 3022	2
3002	Output to proportional valve shorted to ground.	X35:42	Short circuit to ground (31) in the current path Excessive current in current path	3021 3022	2
3001	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:42	Current path has connection to +Ub (15 or 30)	3021 3022	5
3006	Fault current regulator	System	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec		2
3007	Fault current regulator	System	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec		2

3008	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be	2	
3009	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be	2	
FaultLocation		Output vibration pump, low amplitude,			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3004	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:42	Current path has connection to +Ub (15 or 30)	3021 3022	5
FaultLocation		Vibration frequency controller, low amplitude			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3014	Frequency/speed to high	System			2
3013	Frequency adaptation, controller has reached lower limiting value	System	Software parameter fault, software update may be rec	3025	1
3012	Frequency adaptation, controller has reached upper limiting value	System	Software parameter fault, software update may be rec	3025	1
3019	Frequency adaptation, saved control values are outside limiting values	System	Software parameter fault, software update may be rec	3026	1
3016	Hardware initializing error	System	ESX hardware defect, hardware replacement may be		3

3015	Hardware initializing error	System	ESX hardware defect, hardware replacement may be		3
3018	Frequency adaptation, controller has reached lower limiting value	System	Software parameter fault, software update may be rec	3026	1
3017	Frequency adaptation, controller has reached upper limiting value	System	Software parameter fault, software update may be rec	3026	1
3011	Frequency adaptation, saved control values are outside limiting values	System	Software parameter fault, software update may be rec	3025	1
FaultLocation					
		Output vibration pump, high amplitude, Y57			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3020	The required control power cannot be transmitted to the proportional solenoid.	X35:42	Line breakage in current path Valve coil defective	3031 3032	2
3029	Initialization error output	System	ESX hardware defect, hardware replacement may be Software parameter fault, software update may be rec		2
3028	Initialization error output	System	Software parameter fault, software update may be rec ESX hardware defect, hardware replacement may be		2
3026	Fault current regulator	System	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec		2

3027	Fault current regulator	System	Line breakage in current path Excessive current in current path Software parameter fault, software update may be rec		2
3025	Output to proportional valve shorted to ground.	X35:42	Short circuit to ground (31) in the current path Excessive current in current path	3031 3032	2
3024	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:42	Current path has connection to +Ub (15 or 30)	3031 3032	5
3023	The required control power cannot be transmitted to the proportional solenoid.	X35:42	Line breakage in current path Valve coil defective	3031 3032	2
3022	Output to proportional valve shorted to ground.	X35:42	Excessive current in current path Short circuit to ground (31) in the current path	3031 3032	2
3021	Supply voltage Ub is applied to the proportional valve output, even though the output is not switched.	X35:42	Current path has connection to +Ub (15 or 30)	3031 3032	5
FaultLocation Vibration frequency controller, high amplitude					
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3033	Frequency adaptation, controller has reached lower limiting value	System	Software parameter fault, software update may be rec	3035	1

3039	Frequency adaptation, saved control values are outside limiting values	System	Software parameter fault, software update may be rec	3036	1
3038	Frequency adaptation, controller has reached lower limiting value	System	Software parameter fault, software update may be rec		1
3037	Frequency adaptation, controller has reached upper limiting value	System	Software parameter fault, software update may be rec	3036	1
3035	Hardware initializing error	System	ESX hardware defect, hardware replacement may be		3
3036	Hardware initializing error	System	ESX hardware defect, hardware replacement may be		3
3034	Frequency/speed too high	System			2
3031	Frequency adaptation, saved control values are outside limiting values	System	Software parameter fault, software update may be rec	3035	1
3032	Frequency adaptation, controller has reached upper limiting value	System	Software parameter fault, software update may be rec	3035	1

FaultLocation		Output vibration shut-off valve front, Y54			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3041	Supply voltage Ub is applied to the output to the solenoid valve, even though the output is not switched.	X35:50	Current path has connection to +Ub (15 or 30)	3040	3
3042	Output to solenoid valve shorted to ground.	X35:50	Short circuit to ground (31) in the current path Excessive current in current path	3040	3

3040	The required control power cannot be transmitted to the solenoid valve.	X35:50	Line breakage in current path Valve coil defective	3040	3
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FaultLocation		Output vibration shut-off valve rear, Y55			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3047	Output to solenoid valve shorted to ground.	X35:51	Excessive current in current path Short circuit to ground (31) in the current path	3041	3
3046	Supply voltage Ub is applied to the output to the solenoid valve, even though the output is not switched.	X35:51	Current path has connection to +Ub (15 or 30)	3041	3
3045	The required control power cannot be transmitted to the solenoid valve.	X35:51	Line breakage in current path Valve coil defective	3041	3

FaultLocation		Output amplitude changeover relay, K43			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3050	The required control power cannot be transmitted to the relay	X35:24	Line breakage in current path	3001	3
3051	Output to relay shorted to ground.	X35:24	Short circuit to ground (31) in the current path Excessive current in current path	3001	3
3052	Supply voltage Ub is applied to the relay output, even though it is not switched.	X23:12	Current path has connection to +Ub (15 or 30)	3001	3

FaultLocation		Input speed transducer vibration motor front, B16			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac

3064	Front vibration is switched on, but no pulses received by the sensor.	X35:34	Line breakage in current path Hardware defect sensors, replacement required No voltage supply (+Ub Pot 15 or 30)	3064	3
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3073	Front vibration is switched on, but no pulses received by the sensor.	X35:34	Line breakage in current path Hardware defect sensors, replacement required No voltage supply (+Ub Pot 15 or 30)	3064	3
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FaultLocation		Input speed transducer vibration motor rear, B17			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3074	Rear vibration is switched on, but no pulses received by the sensor.	X35:35	Line breakage in current path Hardware defect sensors, replacement required No voltage supply (+Ub Pot 15 or 30)	3065	3
3065	Rear vibration is switched on, but no pulses received by the sensor.	X35:35	Line breakage in current path Hardware defect sensors, replacement required No voltage supply (+Ub Pot 15 or 30)	3065	3

FaultLocation		Phase synchronizing function			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3071	Frequency controller has reached upper limit	System	Software parameter fault, software update may be rec		3
3072	Frequency controller has reached lower limit	System	Software parameter fault, software update may be rec		3

FaultLocation		Output phase synchronization valve front, Y165			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3077	The required control power cannot be transmitted to the proportional solenoid.	X35:22	Line breakage in current path Valve coil defective		3
3075	Valve 1 current regulator has reached upper limit	X35:22	Software parameter fault, software update may be rec		3
3076	Valve 1 current regulator has reached lower limit	X35:22	Software parameter fault, software update may be rec		3

FaultLocation		Output phase synchronization valve rear, Y172			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3080	Valve 2 current regulator has reached upper limit	X35:44	Software parameter fault, software update may be rec		3
3082	The required control power cannot be transmitted to the proportional solenoid.	X35:44	Line breakage in current path Valve coil defective		3
3081	Valve 2 current regulator has reached lower limit	X35:44	Software parameter fault, software update may be rec Software parameter fault, software update may be rec		3

FaultLocation		Water sprinkling system, tank filling level			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3100	Informative message - water tank empty and pump running	X26:10		3100 3102	0

FaultLocation		Input tank level sensor, water sprinkling system			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3103	Signal fault□Signal outside the valid range (see signal description)	X27:11		3100	1
3104	The water level sensor has not been parameterized correctly	System			0

FaultLocation		Water sprinkling system, sprinkling interval switch			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3106	Supply connection Connection of sensor/switch faulty□The voltage applied to the input is outside the specified range (see signal description).	X23:12	Line breakage in current path No voltage supply (+Ub Pot 15 or 30)	3107	3
3105	Ground Connection of sensor/switch faulty□The voltage applied to the input is outside the specified range (see signal description).	X23:12	Line breakage in current path	3107	3
3107	Signal fault□Signal outside the valid range (see signal description)	X23:12	Line breakage in current path Hardware defect sensors, replacement required	3107	3

FaultLocation		Relay output water sprinkling system pump 1, K80			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3110	The required control power cannot be transmitted to the relay	X35:25	Line breakage in current path		3
3111	Output to relay shorted to ground.	X35:25	Short circuit to ground (31) in the current path Excessive current in current path		3

3112	Supply voltage Ub is applied to the relay output, even though it is not switched.	X35:25	Current path has connection to +Ub (15 or 30)	3
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FaultLocation		Relay output water sprinkling system pump 2, K79			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3117	Supply voltage Ub is applied to the relay output, even though it is not switched.	X35:62	Current path has connection to +Ub (15 or 30)		3
3115	The required control power cannot be transmitted to the relay	X35:62	Line breakage in current path		3
3116	Output to relay shorted to ground.	X35:62	Short circuit to ground (31) in the current path Excessive current in current path		3

FaultLocation		Output sprinkling valve edge cutter, right, Y99			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3120	The required control power cannot be transmitted to the valve.	X22:8	Line breakage in current path Valve coil defective		3
3121	The output to the valve has ground contact, or the output current is higher than permitted.	X22:8	Short circuit to ground (31) in the current path Excessive current in current path		3
3122	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:8	Current path has connection to +Ub (15 or 30)		3

FaultLocation		Relay output emulsion sprinkling system pump, K7			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac

3127	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:9	Current path has connection to +Ub (15 or 30)	3
3126	The output to the valve has ground contact, or the output current is higher than permitted.	X22:9	Short circuit to ground (31) in the current path Excessive current in current path	3
3125	The required control power cannot be transmitted to the valve	X22:9	Line breakage in current path Valve coil defective	3

FaultLocation		Output sprinkling valve Y06			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3137	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:26	Current path has connection to +Ub (15 or 30)		3
3135	The required control power cannot be transmitted to the valve	X22:26	Line breakage in current path		3
3136	The output to the valve has ground contact, or the output current is higher than permitted.	X22:26	Short circuit to ground (31) in the current path Excessive current in current path		3

FaultLocation		Output sprinkling valve edge cutter, left, Y191			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3147	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:35	Current path has connection to +Ub (15 or 30)		3
3146	The output to the valve has ground contact, or the output current is higher than permitted.	X22:35	Short circuit to ground (31) in the current path Excessive current in current path		3

3145	The required control power cannot be transmitted to the valve	X22:35	Line breakage in current path Valve coil defective	3
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FaultLocation		Output valve edge cutter, right, up Y20			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3150	The required control power cannot be transmitted to the valve	X22:10	Line breakage in current path Valve coil defective		3
3151	The output to the valve has ground contact, or the output current is higher than permitted.	X22:10	Short circuit to ground (31) in the current path Excessive current in current path		3
3152	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:10	Current path has connection to +Ub (15 or 30)		3
FaultLocation		Output valve edge cutter, right, down Y21			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3155	The required control power cannot be transmitted to the valve	X22:11	Line breakage in current path Valve coil defective		3
3156	The output to the valve has ground contact, or the output current is higher than permitted.	X22:11	Short circuit to ground (31) in the current path Excessive current in current path		3
3157	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:11	Current path has connection to +Ub (15 or 30)		3

FaultLocation		Output valve chip spreader, Y66			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3167	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:13	Current path has connection to +Ub (15 or 30)		3
3165	The required control power cannot be transmitted to the valve	X22:13	Line breakage in current path		3
3166	The output to the valve has ground contact, or the output current is higher than permitted.	X22:13	Excessive current in current path Short circuit to ground (31) in the current path		3

FaultLocation		Output valve chip spreader adjustment up, Y131			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3170	The required control power cannot be transmitted to the valve	X22:19	Line breakage in current path Valve coil defective		3
3172	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:19	Current path has connection to +Ub (15 or 30)		3
3171	The output to the valve has ground contact, or the output current is higher than permitted.	X22:19	Short circuit to ground (31) in the current path Excessive current in current path		3

FaultLocation		Output valve chip spreader adjustment down, Y67			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3176	The output to the valve has ground contact, or the output current is higher than permitted.	X22:21	Short circuit to ground (31) in the current path Excessive current in current path		3

3177	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:21	Current path has connection to +Ub (15 or 30)	3
3175	The required control power cannot be transmitted to the valve	X22:21	Line breakage in current path	3

FaultLocation		Output changeover of chip spreader movement dire			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3182	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:22	Current path has connection to +Ub (15 or 30)		3
3180	The required control power cannot be transmitted to the valve	X22:22	Line breakage in current path		3
3181	The output to the valve has ground contact, or the output current is higher than permitted.	X22:22	Short circuit to ground (31) in the current path Excessive current in current path		3

FaultLocation		Output valve edge cutter, left, up Y239			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3190	The required control power cannot be transmitted to the valve	X22:12	Line breakage in current path Valve coil defective		3
3191	The output to the valve has ground contact, or the output current is higher than permitted.	X22:12	Short circuit to ground (31) in the current path Excessive current in current path		3
3192	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:12	Current path has connection to +Ub (15 or 30)		3

FaultLocation		Output valve edge cutter, left, down Y240			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
3195	The required control power cannot be transmitted to the valve	X22:36	Line breakage in current path Valve coil defective		3
3197	Supply voltage Ub is applied to the valve output, even though the valve is not switched.	X22:36	Current path has connection to +Ub (15 or 30)		3
3196	The output to the valve has ground contact, or the output current is higher than permitted.	X22:36	Short circuit to ground (31) in the current path Excessive current in current path		3
FaultLocation		Input engine speed B92			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5015	Engine running, but no plus signal arrives in the control	X35:16	Line breakage in current path Sensors not correctly installed or not adjusted No voltage supply (+Ub Pot 15 or 30) Hardware defect sensors, replacement required	5000	3
5014	Engine speed too low	X35:16	Line breakage in current path Sensors not correctly installed or not adjusted No voltage supply (+Ub Pot 15 or 30) Hardware defect sensors, replacement required	5000	3
FaultLocation		Engine speed detection			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac

5016	Engine speed too high, error in engine speed measurement	System	Software parameter fault, software update may be required Parameter error, possibly machine type incorrectly configured	5011	3
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FaultLocation		Input D+ detection			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5017	Engine running but no D+ signal present	X26:03	Line breakage in current path Generator or charge regulator defective	5024	0

FaultLocation		Input engine oil pressure monitoring B06			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5021	Fault: No oil pressure	X26:07		5020	5

5020	Warning: No oil pressure	X26:07		5020	0
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FaultLocation		Input coolant level monitoring B55			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5024	Warning: Coolant filling level too low	X26:05		5021	0

5025	Fault: Coolant filling level too low	X26:05		5021	5
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FaultLocation		Input air filter sensor B03			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5026	Warning: Air filter dirty	X26:04		5025	1

5027 Fault: Air filter dirty X26:04 5025 5

FaultLocation		Input water separator, B124			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5028	Warning: Water in fuel filter	X27:4		5026	0
5029	Fault: Water in fuel filter	X27:4		5026	5
FaultLocation		Input coolant temperature switch 1			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5030		X26:06			0
5031		X26:06			3
FaultLocation		Input coolant temperature switch B53			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5033	Fault: Coolant temperature too high	X26:11		5023	5
5032	Warning: Coolant temperature too high	X26:11		5023	0
FaultLocation		Input level switch for fuel filling level, R03			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5050	Signal fault□Signal outside the valid range (see signal description)	X27:2	Hardware defect sensors, replacement required Line breakage in current path	5050	1

FaultLocation		Output EGAS actuator diesel engine, M39			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5201	Supply voltage Ub is applied to the relay output, even though it is not switched.	X35:64	Current path has connection to +Ub (15 or 30)		2
5203	Insufficient current flow at output to relay	X35:64	Excessive current in current path		3
5205	EGAS actuator does not move, even though current is flowing.	X35:64	EGAS actuator mechanically blocked		3
5202	Output to relay shorted to ground.	X35:64	Short circuit to ground (31) in the current path		3
5200	The required control power cannot be transmitted to the relay	X35:64	Line breakage in current path EGAS actuator diesel engine defective Relay K 176 defective		3

FaultLocation		Input feedback potentiometer EGAS actuator diesel			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5204	Signal outside the valid range	X35:31	Repeat teach function for EGAS actuator	5110 5111 5112	3
5206	Supply connection Connection of sensor/switch faulty□The voltage applied to the input is outside the specified range (see signal description).	X35:31	Line breakage in current path		3

5207	Ground Connection of sensor/switch faulty □ The voltage applied to the input is outside the specified range (see signal description).	X35:31	No voltage supply (+Ub Pot 15 or 30) Line breakage in current path	3
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FaultLocation		EGAS actuator diesel engine, M39			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5209	Informative code - The teach function for the EGAS actuator has not yet been successfully performed. (see adjustment instructions)	System	Repeat teach function for EGAS actuator		1

FaultLocation		Input hydraulic oil filter B21 and B22			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5500	Warning: Hydraulic oil filter dirty	X35:36	Check filter, if necessary clean or replace as per servi		1
5501	Fault: Hydraulic oil filter dirty	X35:36	Check filter, if necessary clean or replace as per servi Check filter, if necessary clean or replace as per servi		5

FaultLocation		Input hydraulic oil temperature sensor B98			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
5504	Warning: Hydraulic oil temperature too high	X27:10			0
5505	Fault: Hydraulic oil temperature too high	X27:10			3

FaultLocation		Machine type management			
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac
7012	Machine type conflict After replacing the control the machine type does not match the old one.	System			2

7011 Fault is used, but cannot be displayed,
but may be disregarded.

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FaultLocation		Setup operating hour meter				
FCode	FaultDescription	Terminal	Possible Cause	Diag	Reac	
7013	Operating hour meter not yet reconstructed	Sysem	Informative code - Follow the adjustment instruction:	8880	1	

FaultLocation	Output brake valve, Y04		
Input	Description	Category	ValueRange
1001	Display voltage output brake	1	

FaultLocation	Travel lever, S55		
Input	Description	Category	ValueRange
1020	Display "Travel lever end positions"	1	0= Neutral 1 = Right 10 = Reverse 100 = Forward 1000 = Left 10000 = BTS brake switched Combinations are possible, e.g. 11100 for forward 100%
1021	Display "Values for axle forward reverse"	1	0..1000 = Forward 0..-1000 = Reverse
1022	Display "Values for axle right left"	1	left -> - 1000..0..1000 -> right, i.e. brake gate
1025	Display "Movement direction acc. to travel lev	1	100 = Forward 0 = Neutral 1 = Reverse

FaultLocation	Travel system		
Input	Description	Category	ValueRange
1026	Display "Movement direction of machine"	1	0 = Neutral 1 = Forward 2 = Reverse
1027	Display "Enabled travel range"	1	0 = locked 1 = enabled
1098	Display of brake distance difference	3	Positive values mean shorter than permitted, negative values mean longer than permitted

1099	Total brake distance	3	Total length of last brake distance in cm
1150	Travel speed	1	Display in km/h
1151	Travel speed calculated	1	Display in km/h
1210		3	

FaultLocation	Input travel stage selector switch, S42
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Input	Description	Category	ValueRange
1040	Display "Selected travel range"	1	0..24
1041	Display "Voltage for speed pre-selection switc	1	
1042	Display "Voltage for speed pre-selection switc	1	0..1000
1044	Value of the corresponding speed pre-selection	1	0..25000 [m/min*100]

FaultLocation	Output valve travel pump forward, Y16
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Input	Description	Category	ValueRange
1070	Display "Actual current value travel pump for	1	Display in mA (0..350..1300)
1071	Display "Nominal current value travel pump fo	1	Display in mA (0..350..1300)
1078	Initial current value (learned surge current) of t	1	Display in mA (permitted range 350mA..600mA)
1079	Maximum current value (derived end current)	1	Display in mA (permitted range 1100mA..1400mA)

FaultLocation	Output valve travel pump reverse, Y17
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Input	Description	Category	ValueRange
1080	Display "Actual current value travel pump reve	1	Display in mA (0..350..1300)
1081	Display "Nominal current value travel pump re	1	Display in mA (0..350..1300)
1088	Initial current value (learned surge current) of t	1	Display in mA (permitted range 350mA..600mA)
1089	Maximum current value (derived end current)	1	Display in mA (permitted range 1100mA..1400mA)

FaultLocation	Teach function travel pump flow controller		
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Input	Description	Category	ValueRange
1090	Release teaching surge currents travel pump	1	see also "Automatic determination of surge currents in travel system"

FaultLocation	Teach function travel pump current regulator		
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Input	Description	Category	ValueRange
1091	Start teaching surge currents travel pump	1	see also "Automatic determination of surge currents in travel system"

FaultLocation	Input speed sensor travel motor, B60		
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Input	Description	Category	ValueRange
1105	Travel speed	1	Display in m/min*100
1106	Pulses of speed sensor	1	Counts the pulses up to 99'999 and starts again at 0

FaultLocation	Travel drive, speed adaptation		
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Input	Description	Category	ValueRange
1230	Release parameter change speed adaptation	3	
1231	Speed adaptation on	3	
1232	Speed adaptation off	3	
1235	Display of adaptation factor travel speed forwa	2	8000..14000
1236	Display of adaptation factor travel speed revers	2	8000..14000

FaultLocation	Travel drive, power limit control		
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Input	Description	Category	ValueRange
1250	Release parameter change power limit control	4	Not usable
1251	Power limit control off	4	Not usable

1252	Power limit control on	4	Not usable
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FaultLocation	Input inclination sensor, B57
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Input	Description	Category	ValueRange
1260	Display inclination sensor position	1	-1000..1000
1261	Display inclination sensor value in percent gra	1	-1000..1000 > -100 % ..100%
1262	Display inclination sensor voltage measuring v	1	0..5000 mV
1263	Display inclination sensor voltage measuring v	1	0..1000
1264	Display inclination sensor status	1	0= Not Initialized, 1 = Initialized (Normal operation), 2 = Error

FaultLocation	Input pressure sensor travel drive, B112
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Input	Description	Category	ValueRange
1270	Display travel pressure	1	0..410 bar
1271	Display pressure sensor current measuring valu	1	0.0 - 22.0 mA
1272	Display pressure sensor measuring value stand	1	0.. 1000
1273	Display pressure sensor status	1	0= Not Initialized, 1 = Initialized (Normal operation), 2 = Error

FaultLocation	Input seat contact switch, S06
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Input	Description	Category	ValueRange
1300	Status seat contact switch	1	0 = seat not occupied; 1 = seat occupied

FaultLocation	Detection of seat position
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Input	Description	Category	ValueRange
1310	Seat position sensor position	1	1= seat forward, 2 = seat backward, 3 = seat out of locked position
1311	Seat position used to work with the machine	1	1= seat forward, 2 = seat backward, 3 = seat out of locked position

1312	Switching condition switches 1 and 2	1	100 = Switch 1 switched 1 = Switch 2 switched The following combinations are possible: 101 = front 100 = rear 001 = not permitted, switch 1 possibly defective
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FaultLocation	Input seat position switch 1, B178
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Input	Description	Category	ValueRange
1313	Switching condition switch 1 (inner)	1	0 = not switched 1= switched

FaultLocation	Input seat position switch 2, B179
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Input	Description	Category	ValueRange
1314	Switching condition switch 2 (outer)	1	0 = not switched 1= switched

FaultLocation	Arm rest, left
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Input	Description	Category	ValueRange
1320	Status arm rest left	1	1= arm rest up; 2= arm rest down

FaultLocation	Input arm rest switch, B132
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Input	Description	Category	ValueRange
1321	Raw measuring value (voltage in V)	1	Display in mV
1322	Travel operation status by arm rest contact	1	1= Driving permitted; 2= Driving disabled

FaultLocation	Steering system
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Input	Description	Category	ValueRange
1350	Enable steering function with joystick buttons	3	not documented
1351	Start steering function with joystick buttons	3	not documented

FaultLocation	Backup alarm
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Input	Description	Category	ValueRange
1990	Display parameters backup alarm operating mo	3	not documented
1991	Enable change of backup alarm operating mod	3	not documented
1992	Backup alarm operating mode off	3	Function switched off, Attention: not permitted!!!
1993	Backup alarm operating mode normal	3	Normal function
1994	Backup alarm operating mode movement alarm	3	Both backup alarms will respond when the machine moves to any direction

FaultLocation	Teach function steering valve surge currents
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Input	Description	Category	ValueRange
2000	Enable teach function to learn steering valve su	1	See adjustment instructions
2001	Start teach function to learn steering valve surg	1	See adjustment instructions

FaultLocation	Steering angle teach function
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Input	Description	Category	ValueRange
2010	Enable teach function for angle transducers	1	See adjustment instructions
2011	Start teach function for angle transducers	1	See adjustment instructions
2012	Confirmation steering stop front	1	See adjustment instructions
2013	Confirmation middle front	1	See adjustment instructions
2014	Confirmation right hand stop front	1	See adjustment instructions
2022	Confirmation left hand stop front	1	See adjustment instructions
2023	Confirmation middle rear	1	See adjustment instructions
2024	Confirmation right hand stop rear	1	See adjustment instructions

FaultLocation	Input steering angle sensor front, B65
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Input	Description	Category	ValueRange
2030	Show current from input front angle sensor	1	3000..21000 mA
2031	Show standardized actual angle value for front	1	-1000..0..1000
2032	Actual angle in degree	1	-37.0 .. 37.0
2033	Stored current value in min. position	1	4000..9000 mA
2035	Stored current value in max. position	1	15000..20000 mA

FaultLocation	Steering angle sensor front, B65
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Input	Description	Category	ValueRange
2034	Stored current value in middle position	1	9000..15000 mA

FaultLocation	Input rear steering angle sensor, B66
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Input	Description	Category	ValueRange
2040	Shows current from input rear angle sensor.	1	3000..21000 mA
2041	Show standardized actual angle value for rear d	1	-1000..0..1000
2042	Actual angle in degree	1	-37.0 .. 37.0
2043	Stored current value in min. position	1	4000..9000 mA
2044	Stored current value in middle position	1	9000..15000 mA
2045	Stored current value in max. position	1	15000..20000 mA

FaultLocation	Output steering valve Y92, front left steering
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Input	Description	Category	ValueRange
2100	Rated current steering valve front left	1	1 mA/ Digit
2101	Actual current steering valve front left	1	1 mA/ Digit
2105	Actual voltage steering valve front left	1	1 mv/ Digit

2110	Min. current steering valve front left	1	1 mA/ Digit
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FaultLocation	Output steering valve Y93, front right steering
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Input	Description	Category	ValueRange
2102	Rated current steering valve front right	1	1 mA/ Digit
2103	Actual current steering valve front right	1	1 mA/ Digit
2106	Actual voltage steering valve front right	1	1 mv/ Digit
2111	Min. current steering valve front right	1	1 mA/ Digit

FaultLocation	Steering valves Y92 and Y93 front
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Input	Description	Category	ValueRange
2112	Current range steering valve front	1	1 mA/ Digit

FaultLocation	Output steering valve Y36, rear left steering
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Input	Description	Category	ValueRange
2120	Rated current steering valve rear left	1	1 mA/ Digit
2121	Actual current steering valve rear left	1	1 mA/ Digit
2125	Actual voltage steering valve rear left	1	1 mv/ Digit
2130	Min. current steering valve rear left	1	1 mA/ Digit

FaultLocation	Output steering valve Y35, rear right steering
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Input	Description	Category	ValueRange
2122	Rated current steering valve rear right	1	1 mA/ Digit
2123	Actual current steering valve rear right	1	1 mA/ Digit
2126	Actual voltage steering valve rear right	1	1 mv/ Digit
2131	Min. current steering valve rear right	1	1 mA/ Digit

FaultLocation	Steering valves Y35 and Y36 front
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Input	Description	Category	ValueRange
2132	Current range steering valve rear	1	1 mA/ Digit

FaultLocation	Steering wheel, A45
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Input	Description	Category	ValueRange
2200		1	
2201		1	
2202		1	
2210	Show number of pulses sensor bearing 1 track	1	0..65535, after overflow start again 0
2211	Show number of pulses sensor bearing 1 track	1	0..65535, after overflow start again 0
2212	Show summarized pulses sensor bearing 1	1	0..65535, after overflow start again 0
2213	Show sense of rotation of steering sensor beari	1	000 undefined 001 turn right 002 turn left 003 error
2220	Show number of pulses sensor bearing 2 track	1	0..65535, after overflow start again 0
2221	Show number of pulses sensor bearing 2 track	1	0..65535, after overflow start again 0
2222	Show summarized pulses sensor bearing 2	1	0..65535, after overflow start again 0
2223	Show sense of rotation of steering wheel senso	1	000 undefined 001 turn right 002 turn left 003 error

FaultLocation	Input crabwalk selector switch, S33
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Input	Description	Category	ValueRange
2250	Set stage on crabwalk selector switch	1	1..24, left hand stop = 1

2251		3	
2252		3	
2254	Set value on crabwalk selector switch	1	- 1000 .. 0 .. +1000

FaultLocation	Crabwalk adjustment
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Input	Description	Category	ValueRange
2255	Set value on sensors	1	- 880 .. 0 .. + 880
2256	Rated value of crabwalk on machine	1	- 880 .. 0 .. + 880

FaultLocation	Input steering mode selector switch, S89
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Input	Description	Category	ValueRange
2260	Set stage on steering mode selector switch	1	1.. 5, 1 = Synchronous, 2 = Auto □ 3 = Front, □4 = Rear, □5 = Diagonal
2261		3	
2262		1	0..1000
2263	Show active steering mode	1	0 = Error 1 = Synchronous, 2 = Auto, 3 = Front, 4 = Rear, 5 = Diagonal

FaultLocation	Steering with joystick buttons
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Input	Description	Category	ValueRange
2300	Enable steering function with joystick buttons	3	

2301	Start steering function with joystick buttons	3	blue button front green button rear
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FaultLocation	Crabwalk parameters
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Input	Description	Category	ValueRange
2320	Release parameter change crabwalk parameters	1	
2321	Set crabwalk speed to slow	1	
2322	Set crabwalk speed to fast	1	
2323	Crabwalk zero position bleep on	3	
2324	Set crabwalk zero position bleep off	3	
2326	Set crabwalk adjustment also via blue buttons	1	
2327	Set crabwalk adjustment also via blue buttons	1	

FaultLocation	Steering direction monitoring
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Input	Description	Category	ValueRange
2330	COMM_STEERING_CHANGE_PAR_CECK	3	
2331	COMM_STEERING_CHECK_TURN_DIR_O	3	
2332	COMM_STEERING_CHECK_TURN_DIR_O	3	

FaultLocation	Vibration system
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Input	Description	Category	ValueRange
3000	Display status of vibration button	1	0 = Vibration off 1 = Vibration on
3001	Display status of vibration changeover relay	1	[2 = low amplitude , 3 = high amplitude]
3002	Display amplitude mode	1	0 = Vibration off 1 = low amplitude 2 = high amplitude

3003	Display drum pre-selection	1	1 = only front 2 = only rear 3 = both drums
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3004	Show pre-selected vibration mode	1	0 = Vibration off 1 = Manual ☐ = Automatic 3 = Chip spreader
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FaultLocation	Output vibration pump, low amplitude, Y56		
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Input	Description	Category	ValueRange
3020	Show status of vibration pump control	3	0 = Vibration pump not controlled 1 = Vibration pump controlled
3021	Display output current vibration pump at low a	1	300 .. 1200 [mA / Digit]
3022	Display output voltage vibration pump at low a	1	[mV/ Digit]

FaultLocation	Vibration frequency controller, low amplitude		
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Input	Description	Category	ValueRange
3025	Display adaptation value, low amplitude, singl	1	1500..4500
3026	Display adaptation value, low amplitude, 2 dru	1	1500..4500

FaultLocation	Output vibration pump, high amplitude, Y57		
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Input	Description	Category	ValueRange
3031	Display output current vibration pump at high	1	300 .. 1200 [mA / Digit]
3032	Display output voltage vibration pump at high	1	[mV/ Digit]

FaultLocation	Vibration frequency controller, high amplitude		
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Input	Description	Category	ValueRange
3035	Display adaptation value, high amplitude, singl	1	1500..4500
3036	Display adaptation value, high amplitude, 2 dr	1	1500..4500

FaultLocation	Output vibration shut-off valve front, Y54		
Input	Description	Category	ValueRange
3040	Display control of vibration shut-off valve fron	1	0 = Vibration shut-off valve front not switched 1 = Vibration shut-off valve front switched (front vibration not possible)
FaultLocation	Output vibration shut-off valve rear, Y55		
Input	Description	Category	ValueRange
3041	Display control of vibration shut-off valve rear	1	0 = Vibration shut-off valve rear not switched 1 = Vibration shut-off valve rear switched (rear vibration not possible)
FaultLocation	Input speed transducer vibration motor front, B16		
Input	Description	Category	ValueRange
3064	Display front vibration frequency	1	0..60.0 [Hz]
FaultLocation	Input speed transducer vibration motor rear, B17		
Input	Description	Category	ValueRange
3065	Display rear vibration frequency	1	0..60.0 [Hz]
FaultLocation	Phase synchronization		
Input	Description	Category	ValueRange
3070	Enable phase pass	3	not available at present
3071	End of phase pass	3	not available at present
3072	Enable parameter change low amplitude	3	not available at present
3073	End of parameter change phase low amplitude	3	not available at present
3074	Enable parameter change high amplitude	3	not available at present
3075	End of parameter change phase high amplitude	3	not available at present

3080	Enable phase adjustment function	1	Operation via "up down" buttons Joystick, saving and quit via button "right"
3082	Enable parameter change phase synchronizatio	4	
3083	Phase synchronization function on	1	
3084	Phase synchronization function off	1	

FaultLocation	Input tank level sensor, water sprinkling system
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Input	Description	Category	ValueRange
3100	Display analog value level sensor water tank	1	0..100 %
3101	Display analog value level sensor water tank (r	4	not available on machines with connected tank
3103	Display value for pressure switch (only BW 15	1	0..100%

FaultLocation	Water sprinkling system, tank filling level
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Input	Description	Category	ValueRange
3102	Display switch for residual water quantity	1	0000 Switch not switched 0001 Switch switched

FaultLocation	Water sprinkling system
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Input	Description	Category	ValueRange
3105	Enable sprinkling also at standstill for testing	1	Only with engine running, machine should not drive!!
3106	Display of sprinkling mode	1	0= Off 1 = On
3107	Display of set sprinkling stage	1	1..12, 1 = left hand stop
3108	Display timer for sprinkling interval	1	
3109	Display output current relay for sprinkling pum	1	[mA / Digit]
3110	Display output current relay for sprinkling pum	1	[mA / Digit]

3111	Display of sprinkling location	1	0 = Drums only, 1 = Drums and edge cutter □ 2 = Edge cutter only
3112	Display status of switch S114 pump 1	1	0 = Switch not operated 1= Switch operated
3113	Display status of switch S114 pump 2	1	0 = Switch not operated 1= Switch operated

FaultLocation	Output valve edge cutter, left, down Y240
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Input	Description	Category	ValueRange
3130	Display of edge cutter parameterization	1	0 = no edge cutter activated 1 = only right edge cutter activated 2 = edge cutters right and left activated 3 = only left edge cutter activated

FaultLocation	Edge cutter
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Input	Description	Category	ValueRange
3131	Enable changes to edge cutter parameters	1	See adjustment instructions
3132	Input code - No edge cutter	1	See adjustment instructions
3133	Input code - Only right edge cutter	1	See adjustment instructions
3134	Input code – Right and left edge cutter	1	See adjustment instructions
3135	Input code - Only left edge cutter	1	See adjustment instructions
3136	Display edge cutter control	1	0 = no movement 1 = up 2 = down 3 = error
3137	Display of switch position change-over edge cu	1	0= front edge cutter selected 1 = rear edge cutter selected

FaultLocation		Chip spreader	
Input	Description	Category	ValueRange
3140	Display of chip spreader type	1	0 = no chip spreader active, 1 = chip spreader via vibration pump
3141	Display of chip spreader adjustment type	1	1 = only Up/Down 2 = additional sideways movement
3142	Enable changes to chip spreader settings	1	See adjustment instructions
3143	Input code – No spreader activated	1	See adjustment instructions
3144	Input code –Activate BOMAG spreading beam	1	See adjustment instructions
3145	Display of chip spreader control	1	0 = Chip spreader not controlled 1 = Chip spreader controlled
3146	Display of push button status chip spreader on/	1	0= Off 1 = On
3147	Input code – Set spreader to spreading beam sp	1	See adjustment instructions
3148	Input code – Set spreader to centrifugal spread	1	See adjustment instructions
3150	Input code – No chip spreader adjustment	1	See adjustment instructions
3151	Input code - Chip spreader adjustment only up/	1	See adjustment instructions
3152	Input code - chip spreader additionally laterally	1	See adjustment instructions
3153	Display – Actual movement direction of chip s	1	0001 = down 0010 = up 1001 = left 1010 = right

FaultLocation		Brake	
Input	Description	Category	ValueRange
500	Start function "Drive against closed brake"	1	0..400 bar
501	Quit function "Drive against closed brake"	1	

FaultLocation	Input engine speed B92		
Input	Description	Category	ValueRange
5000	Display of diesel engine speed	1	0.. 3500 rpm

FaultLocation	Engine speed detection		
Input	Description	Category	ValueRange
5001	Display of diesel engine speed command	1	0.. 3500 rpm

FaultLocation	Engine speed default		
Input	Description	Category	ValueRange
5002	Display engine speed mode diesel engine, com	1	0 = Low idle speed 1 = Eco mode 2 = Full speed position
5003	Display engine speed mode diesel engine, defa	1	0 = Low idle speed 1 = Eco mode 2 = Full speed position
5004	Display input switch min (idle speed position)	1	0= off 1 = on
5005	Display input switch max (full speed position)	1	0= off 1 = on
5010	Display parameters min speed diesel engine (id	3	
5011	Display parameters max speed diesel engine (f	3	

FaultLocation	Input working lights		
Input	Description	Category	ValueRange
5006	Display input switch working lights	1	0= off 1 = on

FaultLocation	Input engine oil pressure monitoring, B06
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Input	Description	Category	ValueRange
5020	Display status oil pressure switch in diesel engi	1	Oil pressure present: = 1 = ok No oil pressure = 0 = not ok when engine is running

FaultLocation	Input coolant level monitoring, B55
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Input	Description	Category	ValueRange
5021	Display "Engine status - coolant level"	1	0= Coolant level OK 1= Coolant level too low

FaultLocation	Input coolant temperature switch, B53
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Input	Description	Category	ValueRange
5022		4	does currently not exist
5023	Status of coolant temperature switch	1	0 = Temperature ok 1 = Temperature too high > 110°C

FaultLocation	Input D+ detection
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Input	Description	Category	ValueRange
5024	Display D+ status of engine	1	0 = not Ok 1 = ok

FaultLocation	Input air filter sensor, B03
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Input	Description	Category	ValueRange
5025	Display "Engine status - air filter"	1	0= Air filter OK 1= Air filter soiled

FaultLocation	Input water separator, B124
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Input	Description	Category	ValueRange
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5026	Display "Status water separator in filter"	1	0 = ok 1 = Water in filter
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FaultLocation **Input level switch for fuel filling level, R03**

Input	Description	Category	ValueRange
5050	Display input level sensor in fuel tank	1	0..255 (raw values)

FaultLocation **EGAS actuator diesel engine, M39**

Input	Description	Category	ValueRange
5100	Enable teach function for EGAS actuator	1	
5101	Input code - confirmation lower limit (idle spee	1	
5102	Input code - confirmation upper limit (full spee	1	
5103	Input code - Quit this function	1	
5110	Display input potentiometer measuring value E	1	0..1000
5111	Display of saved parameter for lower limit (idl	1	BW 154 AP [50..300] BW 174 AP [280..480]
5112	Display of saved parameter for upper limit (full	1	BW 154 AP [540..740] BW 174 AP [830..1030]
5500	Display status of hydraulic oil filter differential	1	0 = Hydraulic oil filter OK 1 = Hydraulic oil filter soiled

FaultLocation **Input hydraulic oil temperature sensor, B98**

Input	Description	Category	ValueRange
5504	Display hydraulic oil temperature status	1	0 = OK, 1 = Temperature too high
5505	Hydraulic oil temperature gauge	1	0.. 90 C

FaultLocation		System	
Input	Description	Category	ValueRange
556	Display of firmware version in display	1	2.xx
557	Display of data collector firmware version	1	1.11
558	Display of travel lever firmware version	4	
559	Display of BLM IO slave module firmware ver	1	
720	Display of machine type	1	73xx see also docu
800		4	
801		4	
802		4	
8870	Enable parameter change fault indication BLM	3	See adjustment instructions!
8871	Do not display BLM errors	3	See adjustment instructions!
8872	Display BLM errors	3	See adjustment instructions!
8880	Restore operating hour meter from DASA	1	See adjustment instructions!
8887	Enable EEPROM copying function	1	See adjustment instructions!
8888	Copy values from DASA into ESX	1	See adjustment instructions!
8889	Copy values from ESX into DASA	1	See adjustment instructions!
8897		4	