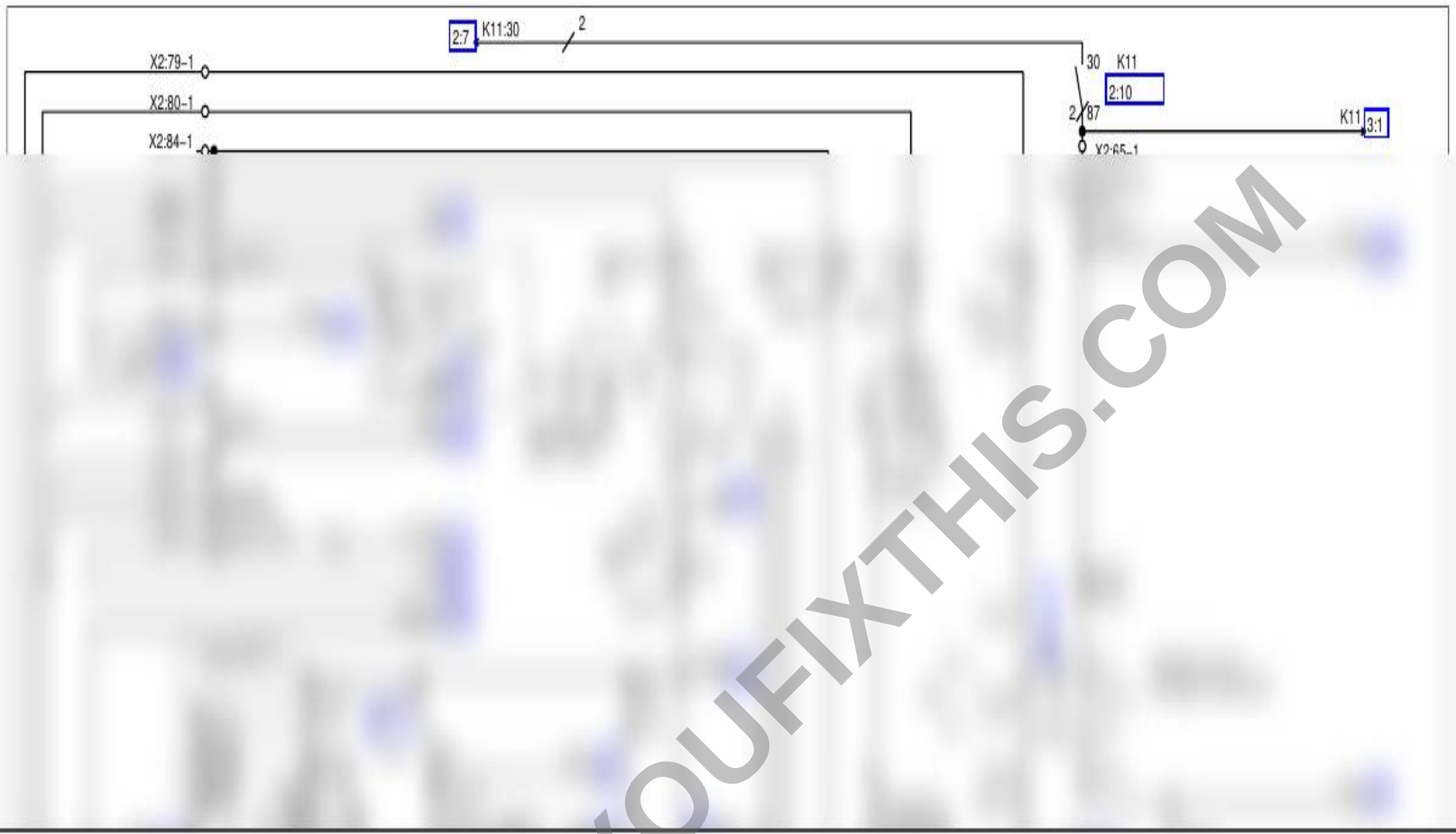


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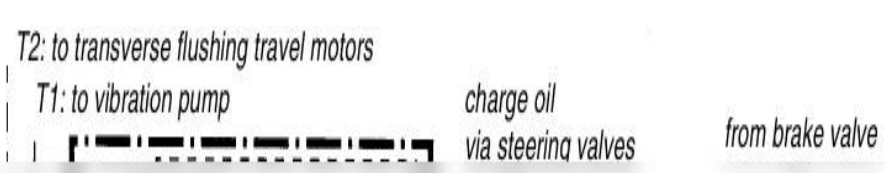


Fig. 1 H

Trave

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6 Description of fault codes on the ESX control

Overview

Fault code	Fault description
00I - 004	Fault output brake
0I0 - 0I3	Fault output control chamber
020 - 024	Fault travel lever
030 - 032	Fault input proximity switch for seat position
040 - 041	Fault input travel speed range switch
050 – 054	Fault output proportional solenoid forward
060 - 064	Fault output proportional solenoid reverse
070 – 072	Fault output engine stop
080 – 088	Messages from engine monitoring
I00	Fault input speed sensor
200 - 20I	Fault input steering mode selector switch
2I0 - 2II	Fault input crabwalk switch
220 - 22I	Fault input crabwalk push button
230	Fault input steering joystick right input steering joystick left
240 - 24I	Fault steering wheel (sensor bearing)
250 – 257	Fault input angle transducer front
260 – 267	Fault input angle transducer rear
270 – 279	Fault output steering front
280 - 289	Fault output steering rear
300 - 30I	Fault input vibration selection / vibration push button
3I0 – 3II	Fault output to enable vibration
400 – 40I	Fault input potentiometer for sprinkler system
410 – 4II	Fault output interval sprinkling
500 - 50I	Warning messages
560 - 562	Fault output sensor voltage supply
800 - 808	Fault messages „Not able to read parameters“
900 - 999	Fault message „Severe internal fault in control“

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Maintenance table

Maintenance work	Remark	Running-in inspection	every 10 oper. hours	every 250 oper. hours	every 500 oper. hours	every 1000 oper. hours	every 2000 oper. hours	as required
Check engine oil level (up to 250 h)	twice every day							
Tighten all bolted connections on air intake, exhaust, oil sump and engine mounts	50 h	X						
Tighten the bolted connections on the machine	50 h	X						
Change the hydraulic oil filter	50 h	X						
Check, adjust the valve clearance	250 h	X						
Check the engine oil level	Dipstick mark		X	X	X	X	X	
Check, clean the water separator			X	X	X	X	X	
Check, clean the fuel supply			X	X	X	X	X	
Check the hydraulic oil level	Inspection glass		X	X	X	X	X	
Check the coolant level			X	X	X	X	X	
Check the condition of the V-belt			X	X	X	X	X	
Change engine oil and oil filter	min. 1x per year			X	X	X	X	
Clean cooling fins on radiator and hydraulic oil cooler				X	X	X	X	
Grease front and rear pivot bearings				X	X	X	X	
Grease the travel bearings	only BW 174			X	X	X	X	
Battery service	dist. water, pole grease				X	X	X	
Replace the fuel filter cartridges					X	X	X	
Check V-belt tension, idler pulley and blower hub						X	X	
Check the engine mounts						X	X	

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Gepr.:
Name:

Gez.: 15.7.3
Name: Kneip

Bauteilliste
component listing

Ers.f.:
Replaces:

Seite:
page: 1 von:
from: 18

Blatt Nr.:
sheet no.: 101

870 100 20

Name	Bl.	Pf.	Benennung	title	TYP
A01	008	2	Intervallschalter	interval switch	13X499OHM
A01	009	3	Intervallschalter	interval switch	13X499OHM
A02	013	8	Blinkrelais	indicator relay	4/6X21 WATT
A02	022	1	Blinkrelais	indicator relay	
A04	008	14	Modul Berieselung	modul, sprinkler system	
A04	009	18	Modul Berieselung	modul, sprinkler system	
A04	022	7	Modul Berieselung	modul, sprinkler system	
A05	012	9	Elektronik Geschwindigkeitsanzeige	Electronic system, speedometer	Modul
A05	021	11	Elektronik Geschwindigkeitsanzeige	Electronic system, speedometer	
A08	005	2	Elektronik Omegameter	Electronic system, Omegameter	
A12	015	17	Radio	Radio	
A15	003	10	Platine Ueberwachungsmodul	Printed circuit board, monitoring module	
A16	012	3	Elektronik Tachograph	Electronic system, tachograph	
A16	021	13	Elektronik Tachograph	Electronic system, tachograph	
A16	023	6	Elektronik Tachograph	Electronic system, tachograph	
A37	014	8	Elektronik Variomatic	Electronic variomatic	ESX 9890
A37	017	8	Elektronik Variomatic	Electronic variomatic	ESX 9890
A37	018	8	Elektronik Variomatic	Electronic variomatic	ESX 9890
A37	018	15	Elektronik Variomatic	Electronic variomatic	ESX 9890
A37	022	16	Elektronik Variomatic	Electronic variomatic	
A45	006	18	Lenkrad	Steering wheel	
A46	014	14	Modul Variomatik	Modul, variomatik	
A46	022	12	Modul Variomatik	Modul, variomatik	
A48	019	7	Elektronische Motorsteuerung	Electronic engine management	
A51	012	3	Platine Frequenzanzeige	Circuit board,frequenzy meter	
A51	021	15	Platine Frequenzanzeige	Circuit board,frequenzy meter	
A51	023	2	Platine Frequenzanzeige	Circuit board,frequenzy meter	
A76	018	19	Druckerkontroller	Printer controller	
A77	018	16	Spannungsregler	Voltage regulator	
B03	003	18	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B06	003	11	Druckschalter Motoroel	Pressure switch, engine oil	0,5BAR
B11	004	8	Signalhorn	Warning horn	
B15	012	12	Aufnehmer Geschwindigkeit	Transducer, speed	
B15	012	14	Aufnehmer Geschwindigkeit	Transducer, speed	
B16	005	17	Aufnehmer Vibrationsfrequenz vorne	Transducer, vibration frequency, front	
B17	005	20	Aufnehmer Vibrationsfrequenz hinten	Transducer, vibration frequency, rear	
B18	005	3	Aufnehmer Omegameter	Transducer, Omegameter	
B21	003	16	Differenzdruckschalter Hydr.−Oelfilter	Pressure diff. switch, hydr. oil filter	
B22	003	17	Differenzdruckschalter Hydr.−Oelfilter	Pressure diff. switch, hydr. oil filter	
B33	008	12	Sensor Wassertankrestmenge	Sensor, water tank residual quantity	
B33	009	18	Sensor Wassertankrestmenge	Sensor, water tank residual quantity	
B34	008	11	Sensor Wassertankrestmenge	Sensor, water tank residual quantity	
B34	009	17	Sensor Wassertankrestmenge	Sensor, water tank residual quantity	
B51	015	16	Lautsprecher Radio	Speaker radio	
B51	015	17	Lautsprecher Radio	Speaker radio	
B53	003	15	Temperaturgeber Kuehlmittel	Temperature switch, collant	105_GC
B55	003	13	Kuehlmittelstand Ausgleichsbehaelter	Coolant charge expansion tank	
B64	007	10	Naeherungsinitiator Sitzposition	Proximity switch, seat	1/15 mA
B65	006	17	Sensor, Lenkwinkel vorn	Sensor, angularity steering, front	4−20 mA
B66	006	19	Sensor, Lenkwinkel hinten	Sensor, angularity steering, rear	4−20 mA
B78	009	14	Druckschalter Berieselungssystem links	Pressure switch,sprinkler sys.lh.	0,5BAR
B79	009	15	Druckschalter Berieselungssystem rechts	Pressure switch,sprinkler sys.rh.	0,5BAR
B84	014	12	Aufnehmer Beschleunigung, links	Trancducer, acceleration, left	
B85	014	11	Aufnehmer Beschleunigung, rechts	Trancducer, acceleration, right	
B88	019	10	Druckgeber Motoroel	Sender, engine oil pressure	
B92	003	1	Aufnehmer, Motordrehzahl	Trancducer, engine speed	
B97	014	10	Aufnehmer Verstellmotor	Sensor, ajustable motor	
B97	017	10	Aufnehmer Verstellmotor	Sensor, ajustable motor	
B103	020	9	Temperaturschalter Klimaanlage	Temperature switch, air conditioning	
B104	020	9	Druckschalter Klimaanlage	Pressure switch, air conditioning	
B106	012	18	Temperatursensor Asphalt	Transducer, temperature asphalt	
B113	019	13	EMR Temperaturgeber Kuehlmittel	EMR Temperature switch, collant	
B114	019	7	EMR Aufnehmer, Motordrehzahl 1	EMR Trancducer, engine speed 1	
B115	019	11	Geber Ladeluftdruck	Sender, charging air pressure	
B124	019	8	Geber Wasserstandsabscheider Diesel	Sender, water separator fuel	
B127	019	8	EMC Positionssensor	EMC position sender	
B128	019	14	EMR Temperaturgeber Ansaugluft	EMR temperature sender manifold air	
E01	013	7	Beleuchtung Tankanzeige	Illumination, level gauge	
E02	013	6	Beleuchtung Temperaturanzeige	Illumination, temperature gauge	
E02	014	20	Beleuchtung Temperaturanzeige	Illumination, temperature gauge	2 WATT
E04	013	7	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E05	013	5	Beleuchtung Frequenzanzeige vorne	Illumination, frequency gauge, front	
E07	013	6	Beleuchtung Omegameter	Illumination, Omegameter	
E08	013	9	Blinkleuchte vorne links	Indicator, front, lh.	21W
E09	013	9	Blinkleuchte hinten links	Indicator, rear, lh.	21W
E09	013	10	Blinkleuchte hinten links	Indicator, rear, lh.	21W
E10	013	11	Blinkleuchte vorne rechts	Indicator, front, rh.	21W
E11	013	11	Blinkleuchte hinten rechts	Indicator, rear, rh.	21W
E11	013	12	Blinkleuchte hinten rechts	Indicator, rear, rh.	21W
E12	013	15	Parkleuchte links	Parking light, lh.	5W
E13	013	13	Schlussleuchte links	Tail light, lh.	5W
E13	013	14	Schlussleuchte links	Tail light, lh.	5W
E14	013	16	Parkleuchte rechts	Parking light, rh.	5W
E15	013	17	Schlussleuchte rechts	Tail light, rh.	5W
E15	013	17	Schlussleuchte rechts	Tail light, rh.	5W
E16	013	19	Scheinwerfer links	Head light, lh.	55 WATT
E16	015	5	Scheinwerfer links	Head light, lh.	55W
E17	013	20	Scheinwerfer rechts	Head light, rh.	55 WATT
E17	015	7	Scheinwerfer rechts	Head light, rh.	55W
E18	013	4	Arbeitsscheinwerfer links	Working head light, lh.	55W
E18	015	5	Arbeitsscheinwerfer links	Working head light, lh.	55W
E19	013	5	Arbeitsscheinwerfer rechts	Working head light, rh.	55 WATT
E19	015	6	Arbeitsscheinwerfer rechts	Working head light, rh.	55W
E23	015	1	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E23	016	17	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55 WATT
E25	015	2	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E25	016	18	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55 WATT

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General

The tandem/combination rollers of series BW 170/174 AD/AC are high performance machines for the extremely difficult use in asphalt compaction and earth work.

The BW 170/174-family consists of the following machines:

- BW 170 AD (2 non-split drums)
- BW 170 AD-AM (2 non split drums, front drum: non split VARIOMATIC II-drum with BOMAG Asphalt Manager, rear drum: Standard drum)
- BW 174 AD (2 split drums)
- BW 174 AD-AM (2 split drums, front drum: split VARIOMATIC II-drum with BOMAG Asphalt Manager, rear drum: split drum)
- BW 174 AC (front drum: split drum, rear: rubber tires)
- BW 174 AC-AM (front drum: split VARIOMATIC II-drum with BOMAG Asphalt Manager, rear: rubber tires)

The machines of this series are powered by a water cooled Cummins diesel engine of series 4BT 3.3.

Engine driven pumps transfer the output power from the engine via electronically controlled hydrostatic circuits for travel system and vibration to the drums or wheels (wheels for travel system only). These hydrostatic drives ensure lowest possible power losses and a high efficiency. Steering function and the additional options chip spreader (cylinder only), edge cutter and Variomatic control are supplied by gear pumps which are driven by the auxiliary drive of the diesel engine.

The machines are equipped with pivot steering, i.e. both cross members for the drums pivot around frame mounted kingpins and are steered by always 2 steering cylinders.

The drive motors for drums/wheels are all fitted with multi-disc brakes. These brakes serve as parking brakes. When starting the engine and opening the brake valve the brakes are relieved by charge pressure. When closing the brake valve or when shutting the engine down the brakes are automatically applied by spring pressure. These parking brakes should not be used as service brake, because the deceleration effect is extremely high and the braking process may damage the brake discs.

Both drums are equipped with an exciter shaft each (VARIOMATIC II drum with 3 exciter shafts). The exciter shafts are driven by hydraulic motors via Bowex couplings. Vibration of the drum is caused by the centrifugal forces generated by the exciter shaft mounted eccentric weights.

Since the machines are designed for operation with two different frequencies and amplitudes, the sense of rotation of the exciter shaft can be reversed (not on VARIOMATIC II / AM). Changing the sense of

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The travel systems of the tandem/combination rollers BW 170/174 AD/AC work with a closed hydraulic circuit. This circuit mainly consists of:

- the travel pump with integrated safety and control elements,
- two drum drive motors (BW170 AD), or four drum drive motors (BW 174 AD), or two drum drive motors and two wheel drive motors (BW 174 AC)
- a flow divider (BW 174-types)
- charge pumps (also for steering and optional functions)
- hydraulic oil filter and hydraulic oil cooler
- and the connecting hoses

Travel pump and vibration pump are joined together to a tandem pump unit. This unit is driven by the flywheel side of the diesel engine with engine speed via an elastic coupling.

All safety and control elements needed for the operation in a closed hydraulic circuit are integrated in the travel pump. These are:

- high pressure relief valves with integrated boost check valves,
- charge pressure relief valve,
- pressure cut-off valve and
- electro-hydraulic control.

Two charge pumps (gear pumps) driven by the auxiliary drive of the diesel engine supply the closed travel circuit with cooled and filtered oil. This compensates leakage and flushing losses occurring during operation. These pumps additionally supply the oil for the steering system and the optionally available edge cutter band chip spreader.
After the above mentioned functions the pump flows from both pumps are joined together and directed to the charge system in the tandem pump for travel and vibration drives. This is necessary, because the vibration system also works with a closed circuit and this charge oil is required to compensate leaks and for cooling.

If the travel pump is electro-hydraulically operated, it delivers hydraulic oil to the parallel arranged drum drive motors. On machines of type BW 174 the oil passes through a flow divider, where it is distributed to the 4 travel motors (see chapter on flow divider).

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When changing the swashing angle through the neutral position to the opposite side (not VARIOCONTROL), the flow direction of the oil and the sense of rotation of the exciter shaft will change.

The displacements to both pumping directions have different adjustments.

This results in different speeds of the vibration motor to both travel directions.

This means:

- High displacement – high speed (frequency).
- Low displacement – low speed (frequency).

The position of the change-over valves depends on the sense of rotation of the exciter shaft. The different positions of the change-over weight in relation to the basic weight results in the following vibration effects:

- High displacement – high frequency – low amplitude
- Low displacement – low frequency – high amplitude

The resistance affecting the rotation of the exciter shaft causes pressure to build up between pump and motor. This pressure closes the boost check valve in the high pressure side of the closed circuit. Feeding of cooled and filtered hydraulic oil can therefore only take place in the low pressure side.

Once the pressure reaches the adjusted value of the pressure override valve the pilot oil flow to the 4/3 way solenoid valve is interrupted. The pressure cannot increase any further.

Sudden pressure peaks are eliminated by high pressure relief valves. In this case hydraulic oil flows from the high pressure side through the boost check valve directly into the opposite side, the low pressure side.

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4.7 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 180
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!
- Enter code number 6 3 0 . This code number activates the function „Automatic measurement of steering valve surge currents“; the display permanently shows the value 6 3 0 . This code number **must** be entered before performing the following steps.
- Each of the four measurements for the four control solenoids must be separately started by entering a code number. The code numbers for the four control solenoids are:

Measure control front left	6 3 1
Measure control front right	6 3 2
Measure control rear left	6 3 3
Measure control rear right	6 3 4

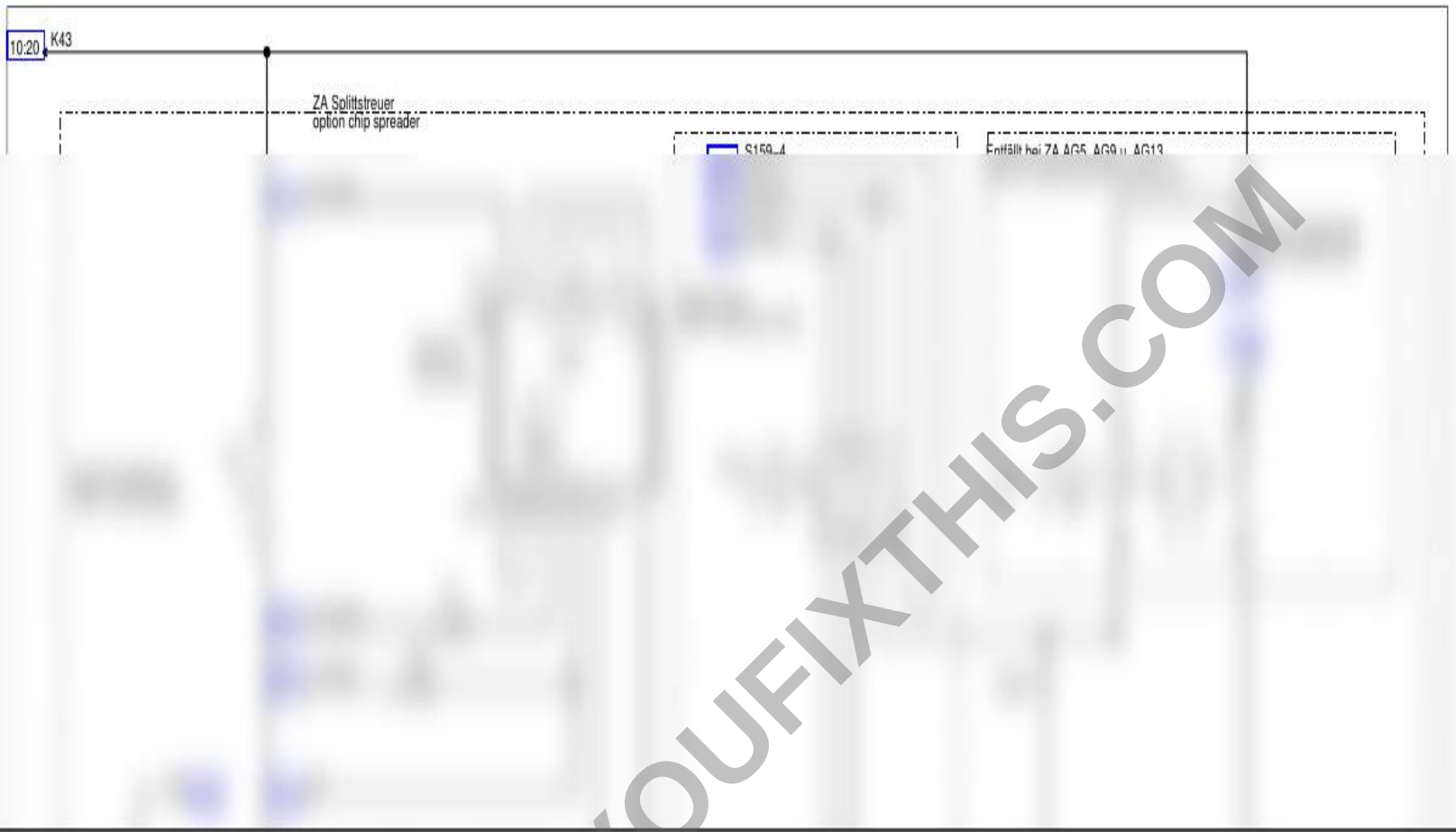
- After entering o0ne of the above mentioned code numbers the measurement of the surge current will start immediately.
- During the measurement the actual current is displayed (display value x 10mA = current).
- **Attention! During the measurement the respective drum cannot be steered !**
- **During the measurement the machine should not be driven !**
- Once the measurement is completed the display value 0 0 0 will appear for 2 seconds, after this the code number 6 3 0 is displayed again and the next measurement can be started. 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.**

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Fault code	Fault description	Possible cause	Terminal on ESX	Input code for diagnose	Fault reaction
2 4 0	Input sensor bearing 1 track 1 Input sensor bearing 1 track 2 Input sensor bearing 2 track 1 Input sensor bearing 2 track 2 The detected pulse figures from sensor bearing 1 and sensor 2 differ by more than 10 pulses.	☞ Wire breakage in one of the current paths ☞ No supply voltage on one of the two sensor bearings ☞ One of the two fuses FM 4 or 5 has tripped ☞ Wire breakage in one of the two current paths for voltage supply ☞ The ground connection for one of the two sensor bearings is interrupted ☞ one or both sensor bearing(s) is/are defective	X1:38 X1:39 X1:36 X1:37	2 4 0 2 4 I 2 4 2 2 4 3	3
2 4 I	Input sensor bearing 1 track 1 Input sensor bearing 1 track 2 Input sensor bearing 2 track 1 Input sensor bearing 2 track 2 The detected senses of rotation of sensor bearing 1 and sensor bearing 2 do not match.	☞ Connections for track 1 and track 2 are mixed up (assembly/service) ☞ Wire breakage in one of the current paths ☞ No supply voltage on one of the two sensor bearings ☞ One of the two fuses FM 4 or FM5 has tripped ☞ The ground connection for one of the two sensor bearings is interrupted ☞ one or both sensor bearing(s) is/are defective	X1:38 X1:39 X1:36 X1:37	2 4 4 2 4 5	3

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