

MGS-DR load detector

Description and notes

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1 MGS-DR load detector

1.1 Use

DR hoists and supporting structures can be protected by means of the MGS-DR load detector.

The units can be used on all DR hoists when certain features are taken into consideration. They are intrinsically safe, i.e. if there is a broken wire, no operating voltage or if an input signal is missing, the load can no longer be lifted.

1.2 Operating principle

The load detector consists of the MGS-DR geared limit switch and the DR control system.

The spring element of the MGS unit consists of an oval steel ring which is deformed by approx. 0,8 mm at rated load. A microswitch arranged between the long sides of the spring element is actuated by the spring motion.

The DR control system evaluates the microswitch signal in order to act on the hoist controls accordingly.

The MGS unit is generally installed at the rope anchorage point (crosshead, retaining plate) or at the upper return or compensating sheave.

The MGS unit must be suspended in such a way that only tensile forces are transmitted.

1.3 MGS limit switch

Since hoist units can be subjected to different loads in accordance with their FEM group, the MGS load cut-off point is adjusted to the relevant rated load before the unit leaves the factory. Refer to the table on page 9 for hoist unit to MGS order number assignments.

Hoist units which have load capacities that do not match the FEM classification have to be fitted with an MGS unit adjusted to the special load capacity before leaving the factory.

Avoid hard blows against the MGS-DR unit as they might modify the switching point setting.

Protective measures must be taken against radiant heat for operation in hot atmospheres. MGS-DR units are not suitable for operation in acid-laden atmospheres. A strain gauge carrier link with additional surface protection must be used in such cases.

MGS-DR units are supplied with a permanently connected measuring cable as standard. This must be connected direct.

MGS-DR limit switches may only be used in connection with a MKA-2 contact evaluator or a DR control system.

Important

The partial load switching point cannot be evaluated when a MKA-2 contact evaluator is used in connection with a MGS-DR unit.

1.4 MGS mounting

MGS-DR units are attached between the rope/return sheave and the connecting structure by means of two pins. The rope-side pin has a minimum play of $Z_{\min}=1,3$ mm in the retaining hole of the connecting structure to enable the MGS spring element to expand in length.

2 Overload cut-off and overload protection function with Dematik® MGS-DR

2.1 General

When a load is lifted, vibrations occur in the rope which are measured as short-term load peaks. These vibrations depend on the load, the lifting speed and the rope length, they should, however, not result in a cut-out at rated load.

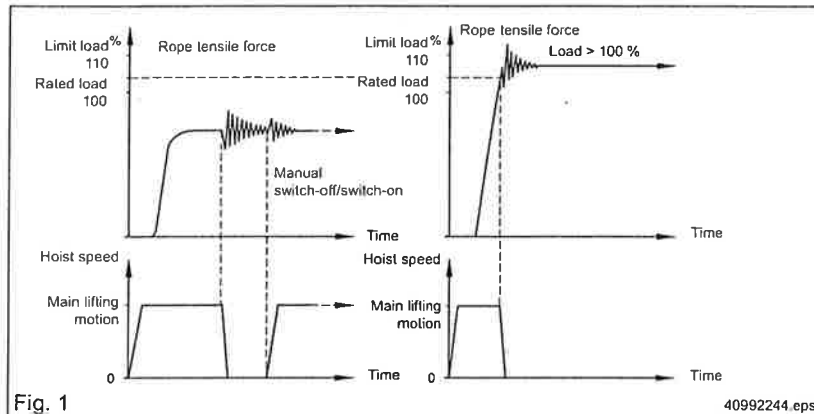
When an unknown load is lifted at great speed, the measuring system will switch off in the event of an overload, however, an overload of the hoist unit cannot be prevented with certainty due to run-on of the hoist motor. This type of load limitation is referred to as overload cut-off.

If, on the other hand, a load is lifted at a relatively small speed, hardly any vibrations occur in the rope. If during the lifting process an overload occurs, the measuring system will detect any load exceeding the rated load very accurately and the hoist unit will be immediately switched off. Owing to the low speed, there is hardly any run-on of the motor so that overloading of the hoist unit is prevented. This type of load limitation is called overload protection. Overload protection is therefore only possible in connection with a creep lifting speed.

2.2 Overload signal/ protection by MGS-DR

The rope force caused by the load is transformed into the actuating path of a cam by means of the spring element (oval ring), which actuates a normally closed switch (MGS). This interrupts a frequency signal, which is fed to two controllers via a digital input arrangement. Both controllers evaluate the signal. In the event of an overload, both controllers terminate the lifting motion independently of each other. The lowering motion is always possible regardless of the load.

The controllers permanently exchange the results of their evaluations via the serial interface. If one of the controllers determines that cut-off of the MGS unit was not detected by the other controller, the first controller creates an error message and prevents the lifting motion.



2.3 Partial load switching point

The partial load switching point (creep lifting time) is not controlled by the MGS-DR unit, but by the slip measurement of the hoist unit motor.

2.4 Inspection

Functioning of the load detection devices must be checked during the prescribed annual inspection of the installation.

We recommend that the annual inspection be carried out by an experienced Demag technician.

2.5 Function check

2.5.1 With DR control

a) with test load

The creep and main lifting motions must be switched off by lifting a load > the limit load. The overload symbol must appear on the display.

b) without test load

The creep and main lifting motions must be interrupted by removing the MGS plug-in connector (X53). The overload symbol must appear on the display.

2.5.2 Without DR control, with MKA-2 contact evaluator

- a) with test load
"CLK", "o.k.", "▲" and "▲" on the front panel indicate that the unit is ready for operation and the ready status.
The „CLK" diode blinks in the rhythm of the measuring intervals during operation. The "▲" light-emitting diode lights up to indicate that the creep lifting speed has been enabled by closed contact 13-14 and "▲" light-emitting diode lights up to indicate that the main lifting speed has been enabled by closed contact 23-24. However, contacts 13-14 and 23-24 are only closed when the "o.k." light-emitting diode lights up at the same time.
- a1) By lifting a load > the partial load and < the limit load, nothing will happen when the MKA-2 unit is used as an overload cut-off; the creep lifting time has to be initiated when it is used as overload protection (main hoist contacts 23-24 are open, "▲" light-emitting diode is off). The main lifting motion is released again after the fixed creep lifting time, which is set to 5 seconds, has elapsed.
- a2) By lifting a load > the limit load, the creep lifting and main lifting contact must open after a maximum of 529 milliseconds when the limit load is exceeded.
- b) no load
Without a test load, only the function of the MKA-2 contact evaluator can be tested.
To do this, the wire must be disconnected from terminal 2 of the MKA-2 unit. The unit must then respond as described in a2).

2.6. Overload signal

- a) Depending on the DSE control pendant type, an overload signal is indicated by means of an overload symbol on the control pendant display for DR hoist units fitted with a DR control system.
- b) In the case of DR hoist units that are not fitted with a DR control system, but which have a MKA-2 contact evaluator, an overload signal is only indicated when the creep and main lifting light-emitting diodes and the OK diode of the MKA-2 contact evaluator are extinguished

3 Safety features

The cable to the contact of the external load detector, the digital input and the signal paths of both controllers are monitored by the use of a dynamic control signal. The lifting motion is immediately disabled if a short circuit with the control voltage or a defective input is detected. Lowering is still possible (emergency operation).

3.1 Notes for the acceptance test of hoist units with overload protection

- a) To enable the test weight of 125% of the rated load to be lifted during the acceptance test of hoist units/crane installations with a DR control system, switch 6 of DIP switch no. 301 must be moved from the "Off" to the "On" position; loads greater than the limit load may then be lifted for a period of 15 minutes. When this period has elapsed, the hoist motion will be switched off when a load greater than the limit load is lifted, regardless of the position of switch 6.
- b) To enable the test weight of 125% of the rated load to be lifted during the acceptance test of hoist units/crane installations that are not fitted with a DR control system, but which have a MKA-2 contact evaluator, contact input 2-3 of the MKA-2 unit must be bridged.

Important

This jumper must be removed following the acceptance test.



Switch off the installation before carrying out any cabling and wiring and maintenance work.

4 Fitting and application instructions

4.1 General

MGS-DR protection switches are built and tested to DIN 57411 Part 1/VDE 0411 Part 1 and DIN ISO 9001 and leave the factory in perfectly safe condition. To maintain this condition and ensure safe operation, the operator must comply with the instructions and warnings contained in this document.

4.2 Measurements

Measurements on the devices or on cables connected to them may only be carried out with high-resistance voltmeters or similar measuring devices. Measurements with simple voltage and continuity testers (buzzers) may destroy the equipment.

4.3 EMC construction guidelines

All units have been tested in accordance with the EMC directives and comply with the relevant standards regarding interference emission and resistance to interference for application in industrial environments.

To comply with the EMC requirements, the following points must be considered for integration into overall systems:

- Integration of electronic components to meet EMC requirements
- Use of prescribed and approved cables, particularly screened cables as required by the operating instructions, if required.
- Connection of the cable shields according to the operating instructions
- Adherence to minimum distances for the application of cables and wiring with different voltages.

4.4 Connection of the electrical equipment

MGS-DR overload switches are electrically connected direct to the crane circuit board. Plug connector X53 is coded to prevent reverse polarity and can only be connected in one plug position. The same plug position is used when an SGS unit is replaced by an MGS unit.

5 Technical data and order numbers

Technical data

MGS-DR	Limit switch
Part no.:	see table below
Switching capacity:	10 mA/24 V =
Ambient temperature:	-20°C to +70°C
Type of enclosure:	IP 67
Mounting position:	any

DR 3 – 10 measuring cable:	LIYY 4 x 0,25
Part no.:	466 933 44

DR 20 measuring cable:	LIYCY 4 x 0,25 screened
Part no.:	466 420 44

MGS part nos.:

DR 3	Part no.
Overload cut-off 2m	719 327 33
Overload cut-off 3m	719 328 33
Overload cut-off 4m	719 329 33

DR 5	Part no.
Overload cut-off 2m	719 527 33
Overload cut-off 3m	719 528 33
Overload cut-off 4m	719 529 33

DR 10	Part no.
Overload cut-off 2m	719 127 33
Overload cut-off 3m	719 128 33
Overload cut-off 4m	719 129 33

DR 20 single groove	Part no.
Overload cut-off 1Am	730 582 33
Overload cut-off 2m	730 583 33
Overload cut-off 3m	730 584 33
Overload cut-off 4m	730 585 33

DR 20 multi-groove	Part no.
Overload cut-off 1Am	730 586 33
Overload cut-off 2m	730 587 33
Overload cut-off 3m	730 588 33
Overload cut-off 4m	730 589 33

Note:

The part numbers contain the following parts:

- MGS complete with cable and plug connector
- 2 off head pins
- 2 off retaining rings
- corresponding number of spacer rings and shims

6 Tables

6.1 MGS overload protective device

Table 1: MGS overload protective device for DR 3 - 10

Hoist unit	Reeving	SWL [kg]	FEM	Force on MGS [kg]	Lever arm	Rope force [kg]	MGS switching point [kg]	MGS part no.
DR 3	2/1	1600	2m	400,00	1/2	800	440,00	719 327 33
		1250	3m	312,50		625	350,00	719 328 33
		1000	4m	250,00		500	280,00	719 329 33
	4/1	3200	2m	400,00		800	440,00	719 327 33
		2500	3m	312,50		625	350,00	719 328 33
		2000	4m	250,00		500	280,00	719 329 33
DR 5	2/1	3200	1Am	1024,46	1/1,5618	1600	1100,00	719 530 33
		2500	2m	800,36		1250	880,00	719 527 33
		2000	3m	640,29		1000	700,00	719 528 33
		1600	4m	512,23		800	550,00	719 529 33
	4/1	6300	1Am	1008,45		1575	1100,00	719 530 33
		5000	2m	800,36		1250	880,00	719 527 33
		4000	3m	640,29		1000	700,00	719 528 33
		3200	4m	512,23		800	550,00	719 529 33
DR 10	2/1	6300	1Am	1575,00	1/2	3150	1760,00	719 130 33
		5000	2m	1250,00		2500	1380,00	719 127 33
		4000	3m	1000,00		2000	1100,00	719 128 33
		3200	4m	800,00		1600	880,00	719 129 33
	4/1	12500	1Am	1562,50		3125	1760,00	719 130 33
		10000	2m	1250,00		2500	1380,00	719 127 33
		8000	3m	1000,00		2000	1100,00	719 128 33
		6300	4m	787,50		1575	880,00	719 129 33
	6/1	16000	2m	1333,33		2667	1380,00	719 127 33
		12500	3m	1041,67		2083	1100,00	719 128 33
		10000	4m	833,33		1667	880,00	719 129 33

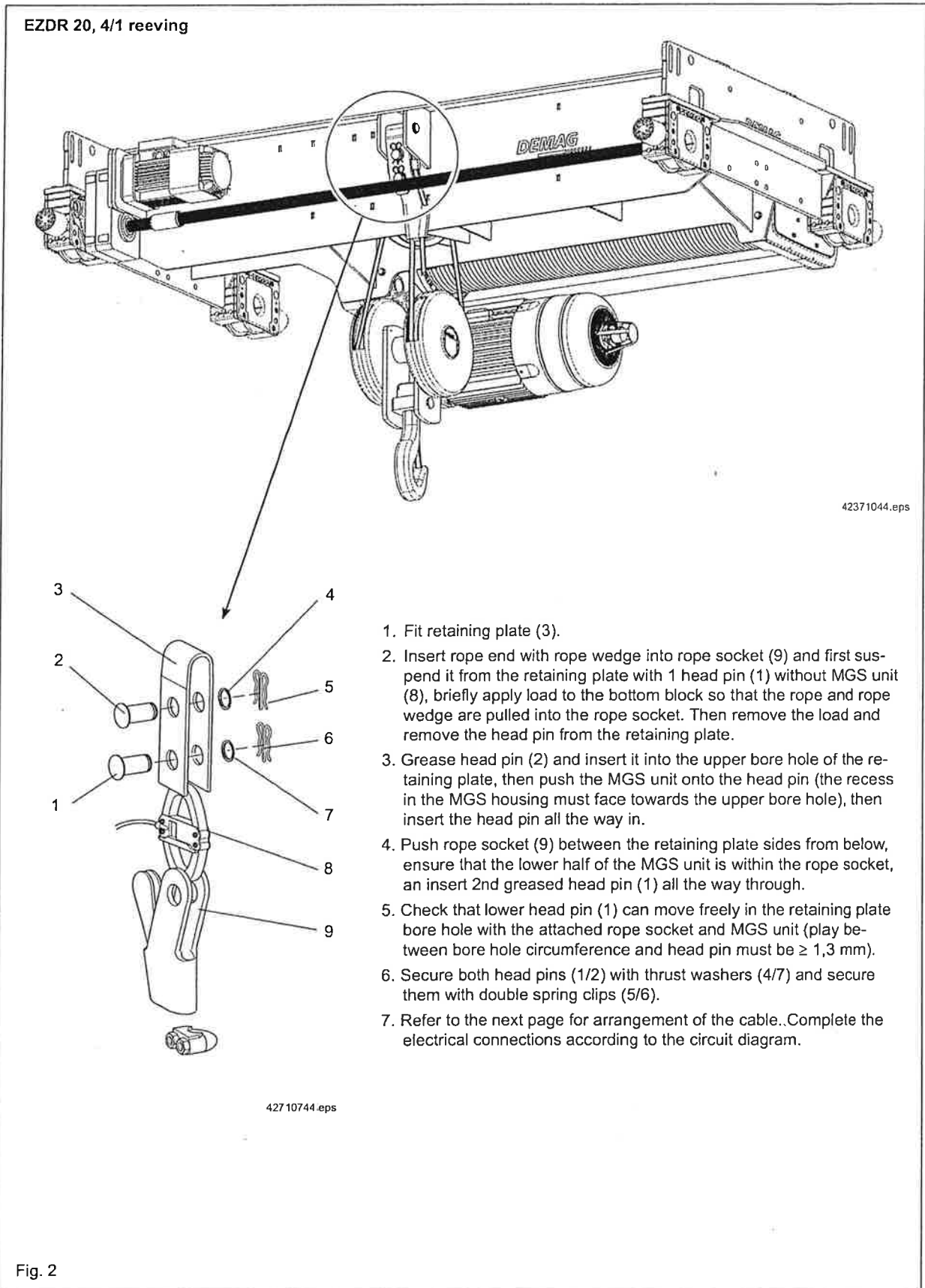
Table 2: MGS overload protective device for DR 20

Reeving	SWL [kg]	FEM	Force on MGS [kg] *	MGS switching point [kg]	MGS part no.
2/1	12500	1Am	6250,0	6880,00	730 582 33
	10000	2m	5000,0	5500,00	730 583 33
	8000	3m	4000,0	4400,00	730 584 33
	6300	4m	3150,0	3470,00	730 585 33
4/1	25000	1Am	6250,0	6880,00	730 528 33
	20000	2m	5000,0	5500,00	730 583 33
	16000	3m	4000,0	4400,00	730 584 33
	12500	4m	3125,0	3470,00	730 585 33
6/1	40000	1Am	6666,7	6880,00	730 582 33
	32000	2m	5333,3	5500,00	730 583 33
	25000	3m	4166,7	4400,00	730 584 33
	20000	4m	3333,3	3470,00	730 585 33
8/1	50000	1Am	6250,0	6880,00	730 582 33
	40000	2m	5000,0	5500,00	730 583 33
	32000	3m	4000,0	4400,00	730 584 33
	25000	4m	3125,0	3470,00	730 585 33
4/2	12500	1Am	3125,0	3470,00	730 586 33
	10000	2m	2500,0	2750,00	730 587 33
	8000	3m	2000,0	2200,00	730 588 33
	6300	4m	1575,0	1760,00	730 589 33
8/2	25000	1Am	3125,0	3470,00	730 586 33
	20000	2m	2500,0	2750,00	730 587 33
	16000	3m	2000,0	2200,00	730 588 33
	12500	4m	1562,5	1760,00	730 589 33

6.2 Crossbars for MGS

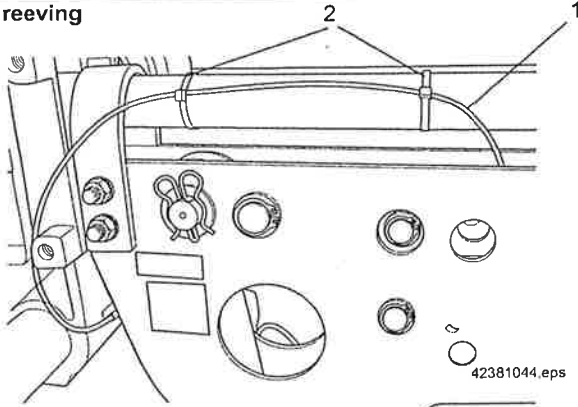
Designation	Drum length	Reeving	FEM	DR 3		DR 5		DR 10	
				Type	Part no.	Type	Part no.	Type	Part no.
MGS overload protect.	H12	2/1	2m	FDR 3	479 833 33	FDR 5	479 860 33	FDR 10	479 884 33
MGS overload protect.	H12	2/1	3m	FDR 3	479 834 33	FDR 5	479 861 33	FDR 10	479 885 33
MGS overload protect.	H12	2/1	4m	FDR 3	479 835 33	FDR 5	479 862 33	FDR 10	479 886 33
MGS overload protect.	H20	2/1	2m	FDR 3	479 836 33	FDR 5	479 863 33	FDR 10	479 887 33
MGS overload protect.	H20	2/1	3m	FDR 3	479 837 33	FDR 5	479 864 33	FDR 10	479 888 33
MGS overload protect.	H20	2/1	4m	FDR 3	479 838 33	FDR 5	479 865 33	FDR 10	479 889 33
MGS overload protect.	H12	2/1	2m	EKDR 3	479 845 33	EKDR 5	479 872 33	EKDR 10	479 896 33
MGS overload protect.	H12	2/1	3m	EKDR 3	479 846 33	EKDR 5	479 873 33	EKDR 10	479 897 33
MGS overload protect.	H12	2/1	4m	EKDR 3	479 847 33	EKDR 5	479 874 33	EKDR 10	479 898 33
MGS overload protect.	H20	2/1	2m	EKDR 3	479 848 33	EKDR 5	479 875 33	EKDR 10	479 899 33
MGS overload protect.	H20	2/1	3m	EKDR 3	479 849 33	EKDR 5	479 876 33	EKDR 10	479 900 33
MGS overload protect.	H20	2/1	4m	EKDR 3	479 850 33	EKDR 5	479 877 33	EKDR 10	479 901 33
MGS overload protect.		2/1	2m			EZDR 5	479 851 33	EZDR 10	479 854 33
MGS overload protect.		2/1	3m			EZDR 5	479 852 33	EZDR 10	479 855 33
MGS overload protect.		2/1	4m			EZDR 5	479 853 33	EZDR 10	479 856 33
MGS overload protect.	H40	4/1	2m					EZDR 10	479 878 33
MGS overload protect.	H40	4/1	3m					EZDR 10	479 879 33
MGS overload protect.	H40	4/1	4m					EZDR 10	479 880 33
MGS overload protect.		6/1	2m					EZDR 10	479 902 33
MGS overload protect.		6/1	3m					EZDR 10	479 903 33
MG overload protect.		6/1	4m					EZDR 10	479 904 33

7 MGS limit switch installation instructions

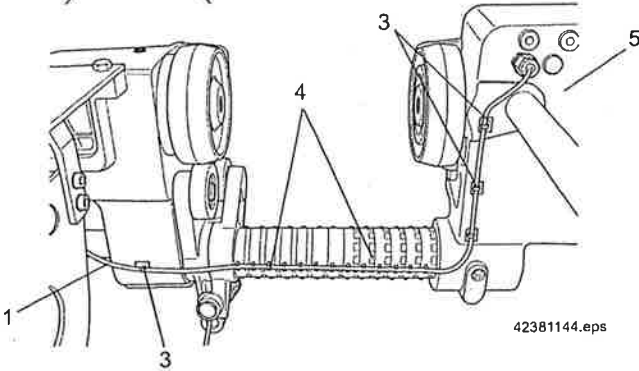


DR 3 - 10 cable arrangement

2/1 reeving



- Lead connecting cable (1) out of the top of the crossbar.
- Secure the connecting cable to the cross member of the DR rope hoist using cable ties (2).

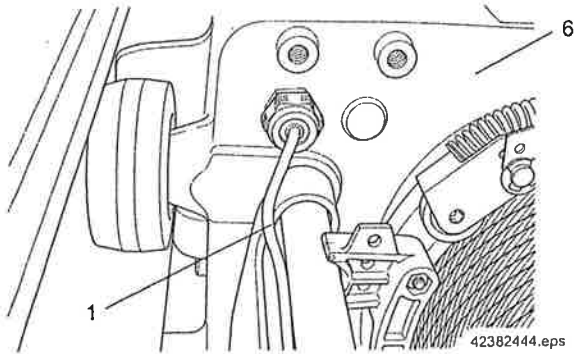


- Attach the connecting cable to the travel roller housing using cable clips (3).

Note:
The cable clips must be glued to the housing; before fitting them, clean the areas where they are attached to the housing using cleaning solvent (free of grease).

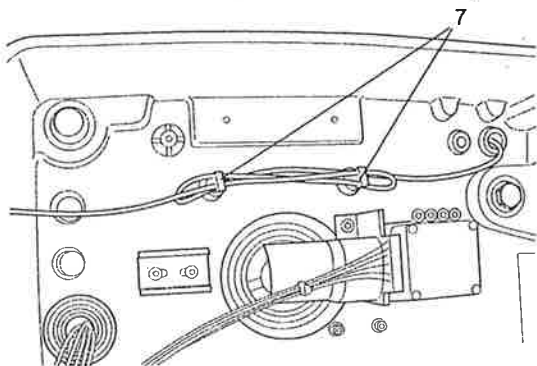
- Secure the connecting cable to the connecting rod of the DR rope hoist using cable guides (4).
- Lead the connecting cable into housing (5) using cable clips.

4/1; 6/1 rope reeving



- Connecting cable (1) can be led direct into housing (6) when the switch is installed, cable clips then do not need to be used from the outside. Secure any excess connecting cable inside the housing as shown in the diagram.

Terminal box, all variants (2/1; 4/1; 6/1)



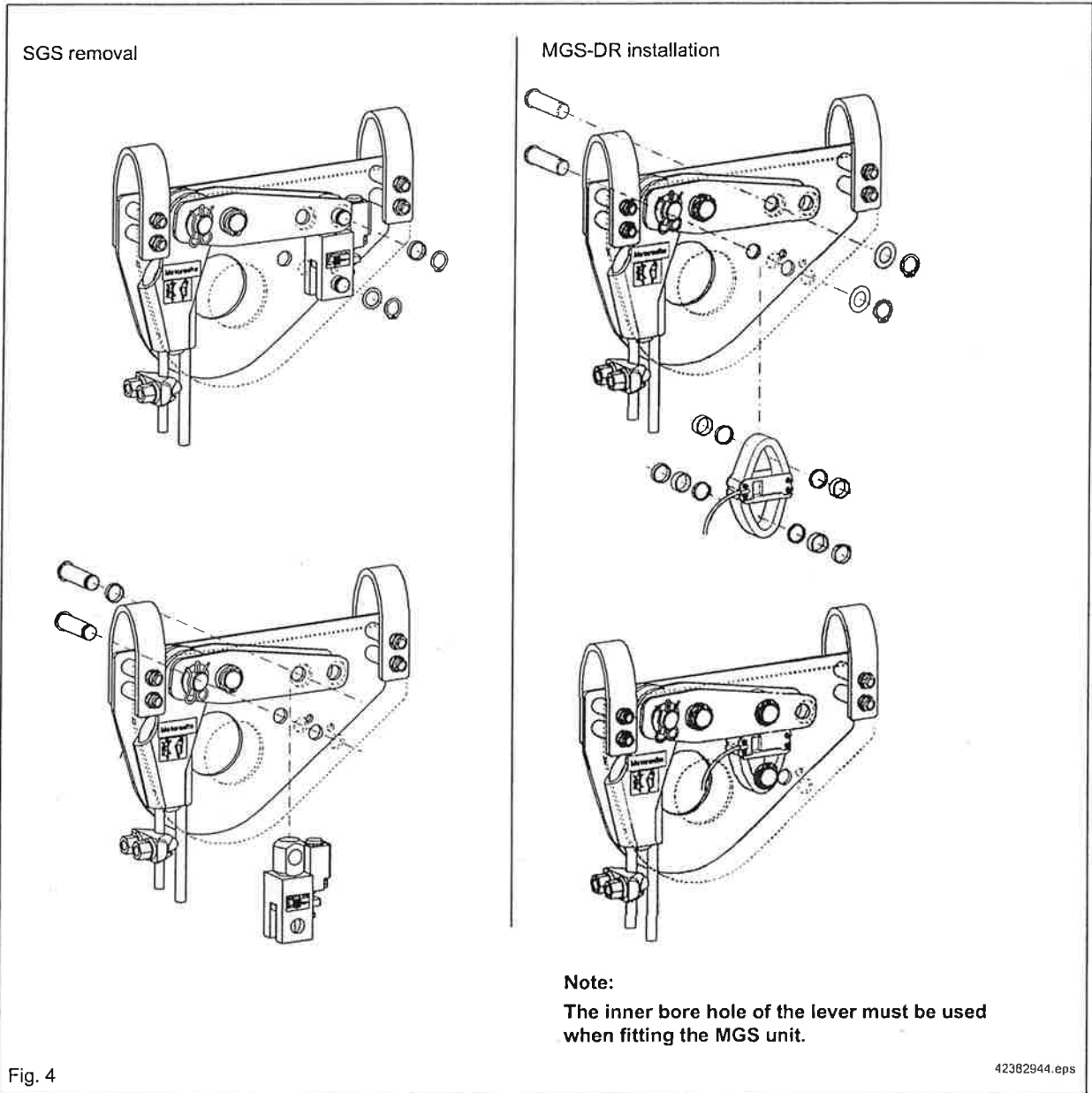
- Introduce a suitable length of the connecting cable into the electrical housing.
- Secure any excess connecting cable in the housing using cable clips (7).

Fig. 3

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8 Replacing SGS units with MGS

Replacement for 2/1 reeving



Replacement for 4/1; 6/1 reeving

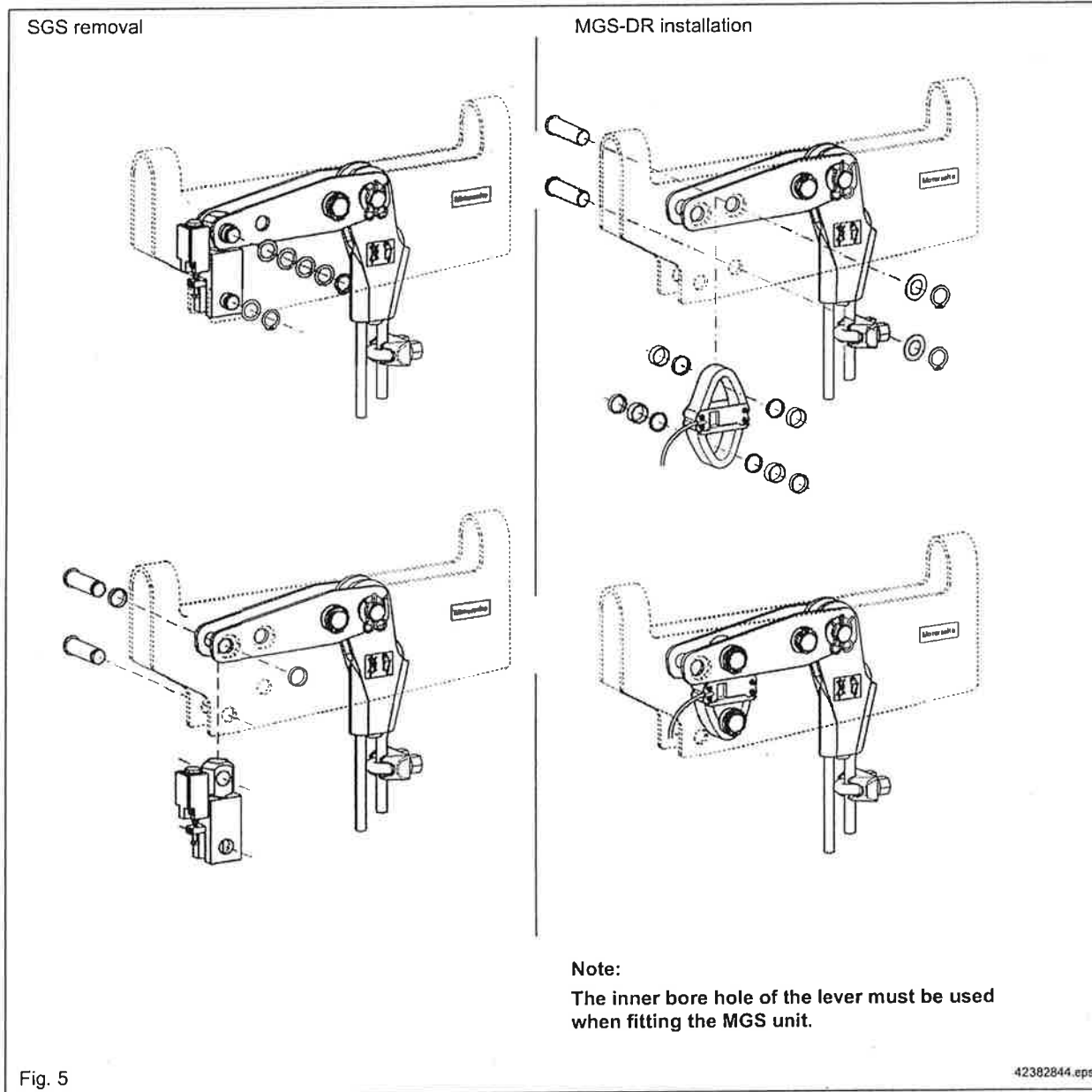


Fig. 5

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9 Instructions for finding faults

Dematik® MGS load limit switch

Fault/measurement	Cause	Remedy
a) MGS incorrectly connected	Wiring error	The plug connector is coded before leaving the factory, it can only be connected to the circuit board in one plug position. Replace the plug or MGS, if necessary
b) Switch-off characteristics	Micro-switch defective	1 Check the micro-switch: No load Limit load => no continuity
c) Visual check	Measuring cable torn off or damaged	Replace the MGS unit (Pay attention to part no./load capacity)
a) MGS incorrectly installed	MGS is mechanically destroyed	
e) Switches off when load < rated load	Incorrect MGS unit	Rope force at 110 % rated load must match the switching point printed on the MGS unit Replace the MGS unit
f) Does not switch off when load > 115 % rated load	1 Incorrect MGS unit 2 MGS out of adjustment 3 Force incorrectly transmitted 4 MGS unit defective 5 MKA-2 or DR control system defective	see e) Replace the MGS unit Check rope suspension and fitting Check the MGS unit Replace the MKA-2 unit or DR control system

10 MGS dimensions/connection dimensions

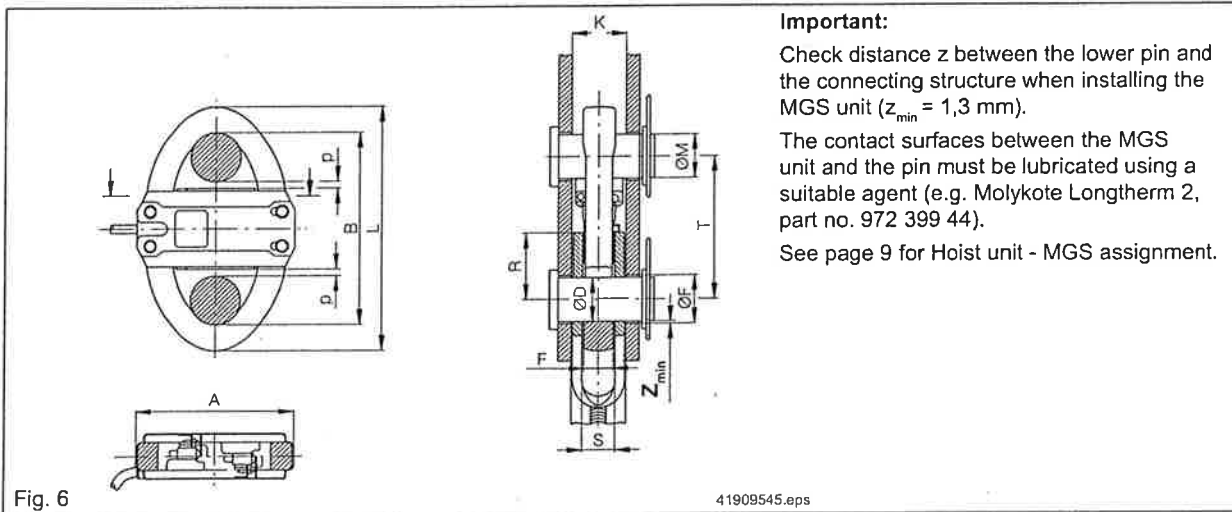


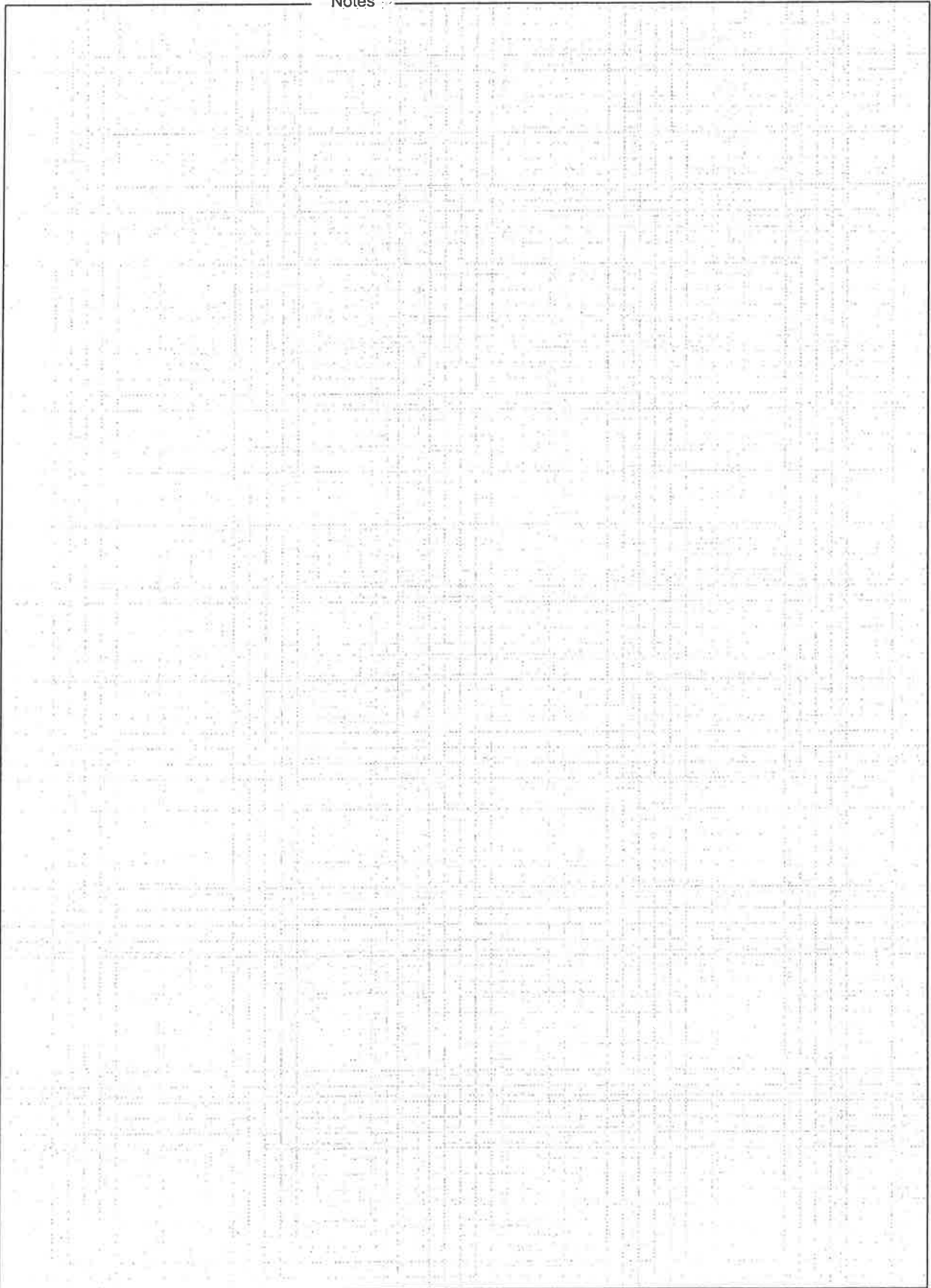
Fig. 6

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Type	Rated load MGS [T]	L [mm]	A [mm]	C [mm]	E [mm]	B+0,2 [mm]	P [mm]	Dh11 [mm]
DR 3	0,5	91	61	19	11,0	76,2	1,7	16
DR 5	1,0	103	67	20	12,5	85,2	2,2	20
DR 10	1,6	107	68	21	13,0	85,2	2,2	20
DR 20 4/2 8/2	3,15	130	81	23	15,0	100,6	4,7	25
DR 20 2/1; 4/1; 6/1; 8/1	5,0	174	108	28	26,0	135,8	2,3/5,8	40

Connection dimensions

Type	T ± 0,2 [mm]	MD11 [mm]	FH13 [mm]	K [mm]	Smin [mm]	Rmax [mm]
DR 3	60,8	16	18,0	21	11	28
DR 5	65,8	20	22,0	25	13	30
DR 10	65,8	20	22,0	28	14	30
DR 20 4/2 8/2	76,0	25	27,5	32	16	35
DR 20 2/1; 4/1; 6/1; 8/1	96,0	40	43,0	50	27	60



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