# Instruction Manual
# RCL
## Safety System

MANUAL # 99903244
REVISED 20071126

**Contents:**

# 1. Introduction.

This operation manual on electronic safety systems is meant for the user of the loader and must be considered as a supplement to the Instruction Manual for the individual loader series.

Certain safety systems are described in the manual; these systems are not standard with the loader, but an optional extra.

The electronic loader safety systems are based on two different types of controllers:
The RCL 5100 used on small and medium-range loaders.
The RCL 5200 used on larger loaders as well as on loaders with certain types of optional extras.

A common characteristic of both safety systems is that the controller is constantly monitoring the loader's conditions as regards load moment, operation and function.

# 2. The Function of the Loader Safety System

The basic principle of the RCL safety system is to secure the loader against overloading and the consequences of this. I.e. independent of the operators doings, the system prevents that the max. permissible load moment is exceeded (load moment limitation).

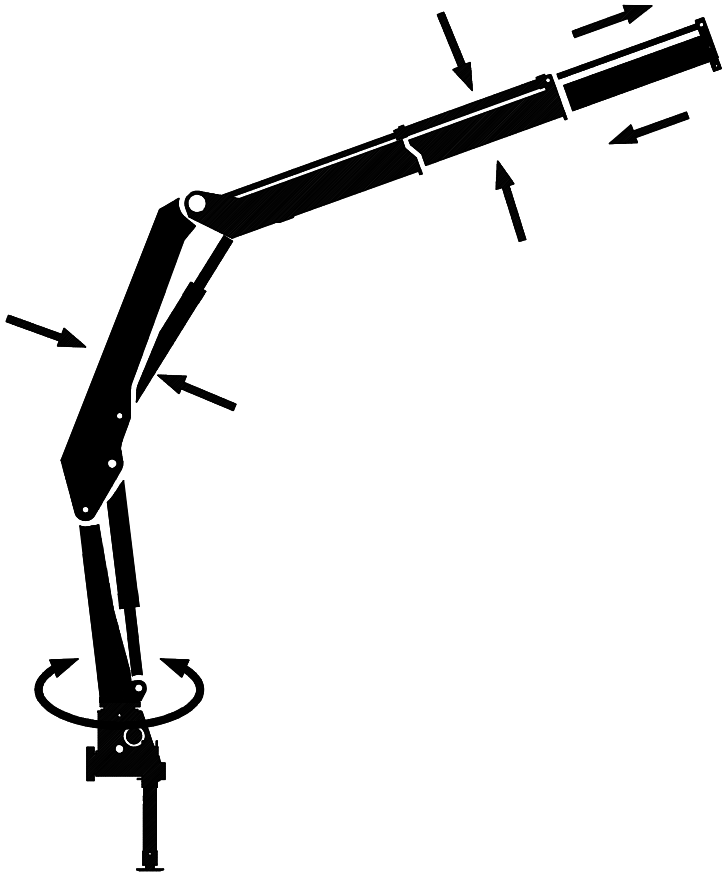
The controller monitors a pressure transducer mounted on the boom cylinder. The pressure transducer registers the hydraulic pressure, which is an indication of the load moment on the loader. The controller registers from the signal from the pressure transducer when the loader has reached its max. permissible load moment and gives signal to the hydraulic system of stopping the load moment incereasing movements.

Intervention from the safety system depends on the type of controller:

- The RCL 5100 stops all loader movements for a shorter or longer period, depending on the way the loader is operated.
- The RCL 5200 stops the loader selectively. I.e. only load moment increasing movements are stopped, but load moment reducing movements can still be activated.

## 2.1 The RCL 5100 Safety System.

Movements blocked in case of overload:

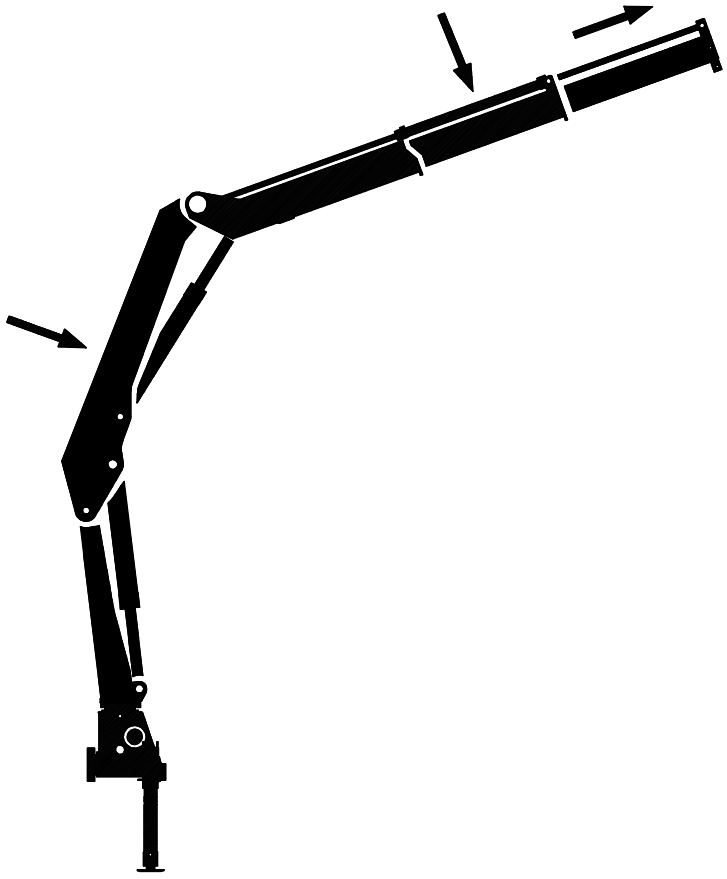


- In case of max. load moment (the diodes up to 100% are lit) all loader movements are stopped as indicated by the arrows.
- The control levers can be operated but building up of a hydraulic pressure in the system is not possible (the dump valve opens so that the oil from the pump flows to tank).
- After a certain non operational time – dependent on how many times the loader has been working with load moment increasing movements, as well as on how big an increase it has been exposed to – all loader functions can be operated again (the dump valve closes so that the oil from the pump can flow to the loader cylinders).

## 2.2 The RCL 5200 Safety System.

Load moment increasing movements blocked in case of overload:

**Jib at an angle between 0° and + 90°.**



Boom down
Jib down
Extension out

**Jib at an angle below 0°**

Jib up
Extension out

- In case of max. load moment (the diodes up to 100% are lit) the load moment increasing movements are stopped as indicated by the arrows.
- The control levers can be operated by activating load moment increasing loader movements as indicated by the arrows, but building up of a hydraulic pressure in the system is not possible (the dump valve opens so that the oil from the pump flows to tank).
- Load moment reducing loader functions as well as the slewing movement can be operated freely (the dump valve closes so that the oil from the pump can flow to the loader cylinders).

## 2.3 Warning when working with the loader safety system!

- The loader safety system increases safety in connection with loader operation, but being the operator you are still responsible for safe operation of the loader.

- Press the stop button if a dangerous situation occurs.

- Be careful when cleaning the loader. Avoid spraying on water and never use high-pressure rinsing for cleaning the electronic components. Also be careful not using noxious chemicals and detergents.

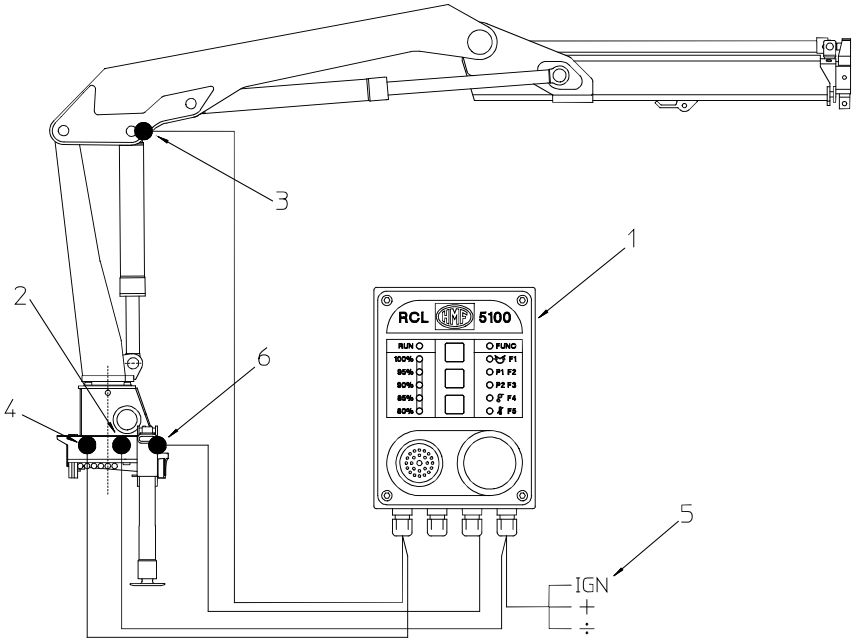
- Troubleshooting must only take place according to this manual; then contact an authorized IMT service point.

- Remove the cable for the power supply, if the battery of the vehicle is discharged, and connect a “boost starter” to start the engine.

- Remove the cable for the power supply, if you are to weld on the vehicle.

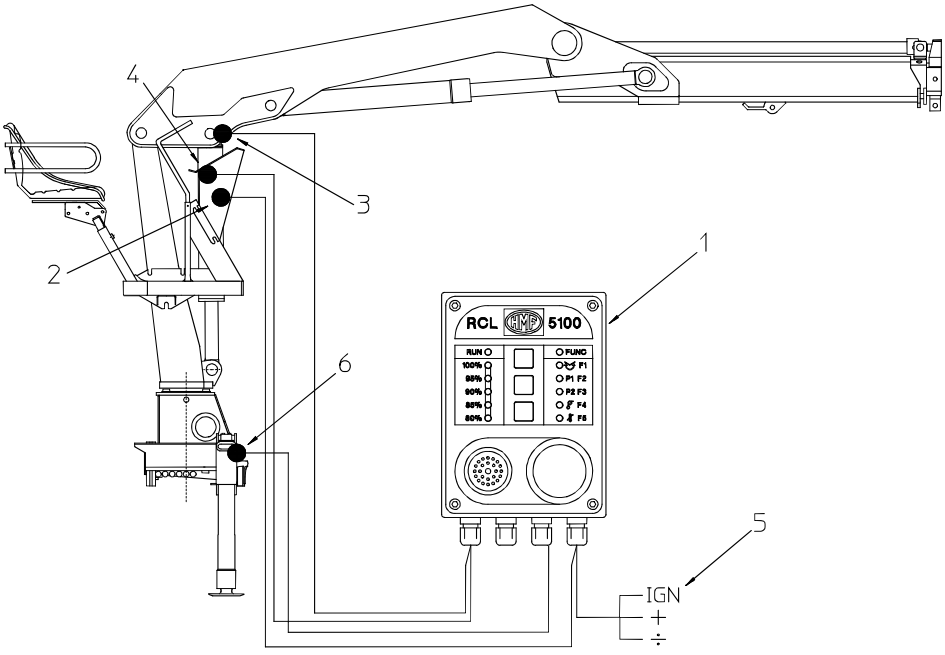
# 3. Basic Configuration

## 3.1 Safety System RCL 5100, standard loader

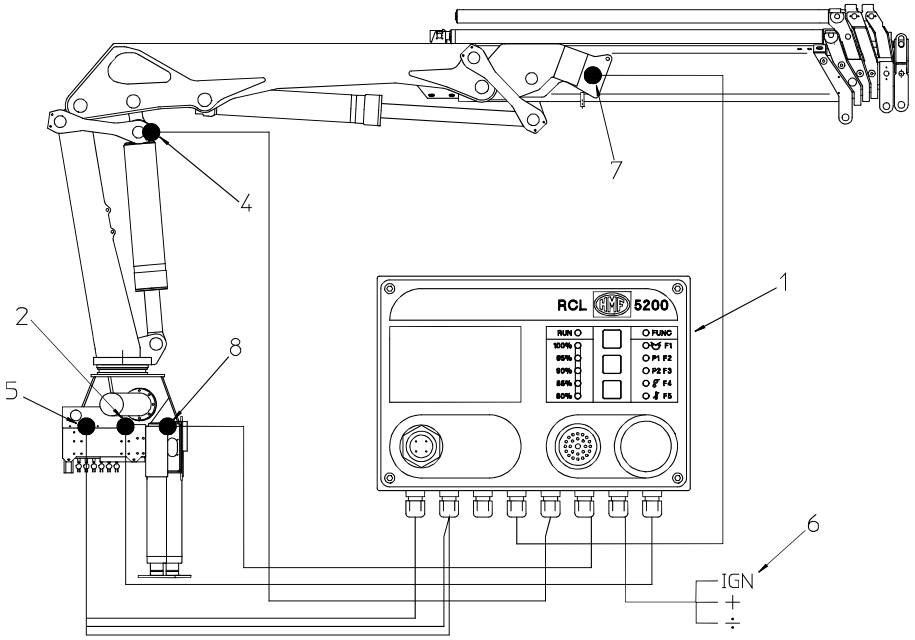



1: RCL 5100 controller
2. Dump valve
3: Pressure transducer
4: Spool sensor (Boom)
5: Power supply
6: External stop button

## 3.2 Safety System RCL 5100, TS, Single Circuit/Dual Circuit

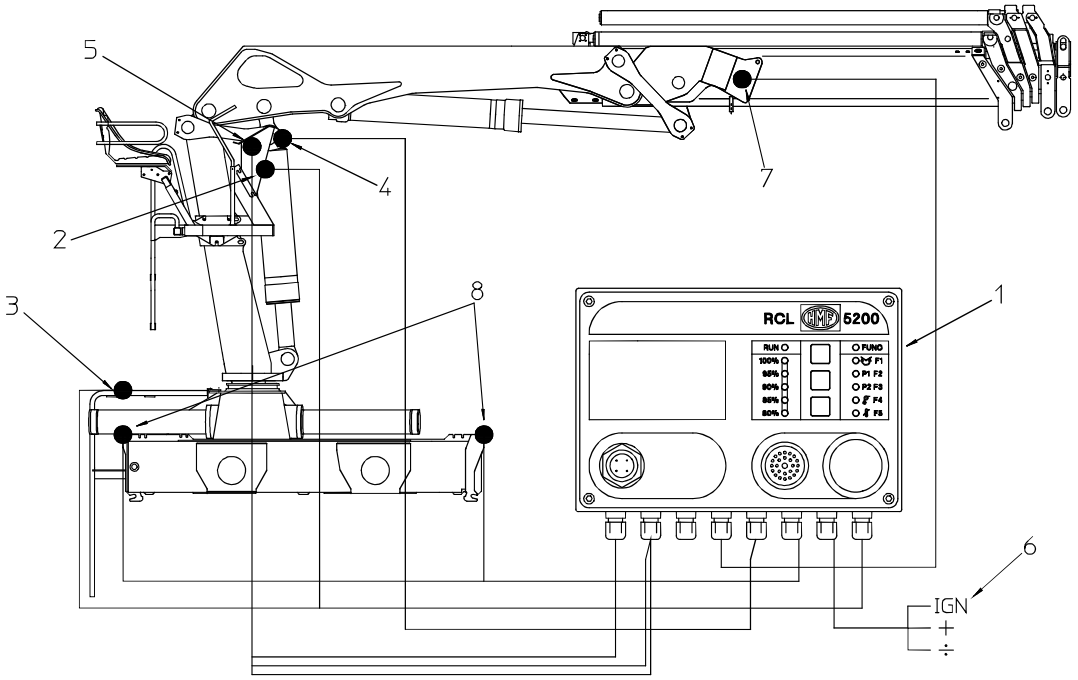


## 3.3 Safety System RCL 5200, standard loader




1: RCL 5200 controller
2: Dump valve
3: Dump valve, 2-circuit
4: Pressure transducer
5: Spool sensors (Boom, Jib, Extension)
6: Power supply
7: Mercury switch
8. External stop button

## 3.4 Safety System RCL 5200, TS, Single Circuit/Dual Circuit



# 4. The Controller's Indicator Panel

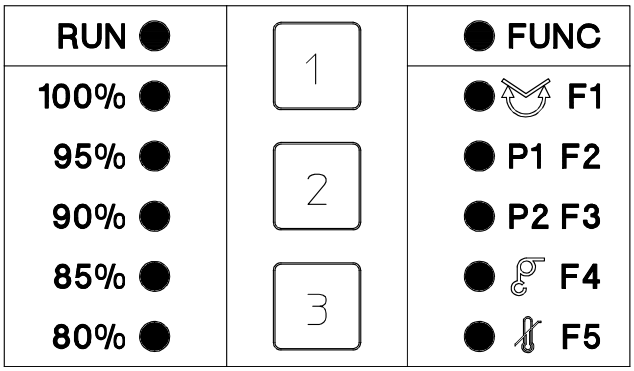
## 4.1 Press Buttons and Indicators

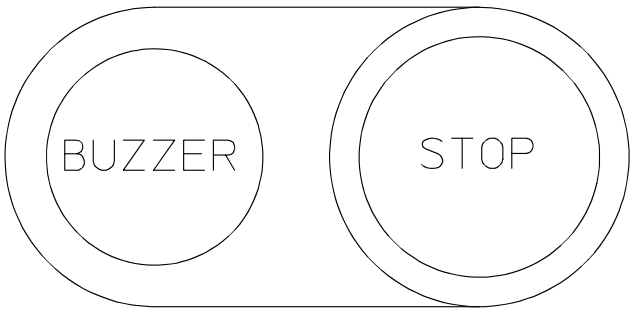
It is important that the operator is familiar with and knows the function of the press buttons and indicators on the controller's indicator panel.

Apart form a few exeptions as to function, the indicator panels on the RCL 5100 and 5200 are identical. The RLC 5200 is larger and also has a plug or connection of a service terminal or a PC.

Press buttons and indicators as shown below are the same both controllers:

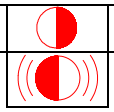
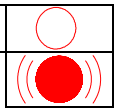
- The RUN diode is green
- The FUNC diode is yellow.
- The other diodes are red.



## 4.2 Function of Press Buttons and Indicators

| Press button | Function |
|---|---|
| 1- Red | Override in case of overloading and instability / indication of errors / manual HDL. |
| 2 – Yellow | Alternative function mode. |
| 3 – Green | System activation / deactivation of buzzer. |

| Indicator | Flashing light |  | Constant light |  |
|---|---|---|---|---|
| | Periodic signal |  | Constant signal |  |

| | | |
|---|---|---|
| BUZZER | Load moment >90% / override / system error. | Any reason for stopping the loader (Dump) |
| RUN | System error. | Normal operation mode. |
| 100% | SLM stop (dump period) | Load moment >100% |
| 95% | SLM stop (dump period) | Load moment >95% |
| 90% | SLM stop (dump period) | Load moment >90% |
| 85% | SLM stop (dump period) | Load moment >85% |
| 80% | SLM stop (dump period) | Load moment >80% |
| FUNC | | Alternative function mode (F1, F2, F3, F4, F5) |
| SVING / F1 | Load moment > max. permissible load moment in reduced working area. (2-stage LMB) | Slewing limitation. |
| | The heel of the vehicle has exceeded the max. permissible limit (the EVS system). | Loader stop (the EVS system) |
| P1 / F2 | Load moment, loader >80%+ loader with largest load moment. | Overload stop – loader. |
| P2 / F3 | Load moment, Fly Jib>80% + Fly Jib with largest load moment. | Overload stop – Fly Jib |
| SPIL. / F4 | Load moment, winch.>100% / Wireudløb / -Wireoverløb.>100% / wire run-out / wire overflow. | Winch stop. |
| TEMP / F5 | Warning at too high oil temperature. | Loader stop at too high oil temperature. |

# 5. Starting Up and End of Loader Operation

## 5.1 Starting Up of the Loader

Before starting up, the operator must carry out the following:

- Connect the pump (PTO); the controller is thus powered.
- Push the green press button (the system is activated).
- The green diode RUN is now constantly lit, indicating that the safety system is ready for operation.
- Prepare the loader for starting up according to the Instruction Manual for the loader.

## 5.2 End of Loader Operation

After loader operation, stop the pump (PTO), the power for the controller is thus interrupted.

## 5.3 The Controller in Stand-By Mode

The controller has been programmed to switch into stand-by mode after 10 minutes.
I.e. if a certain loader function (with spool sensor) has not been operated for the last 10 minutes, the controller will automatically turn off and go into stand by mode where the power consumption is reduced to 10%.

The following factors reactivate the controller:

- When pushing the green press button.
- When activating the control lever for the boom function (or dependent on which optional extra is used, any of the control levers with a spool sensor).

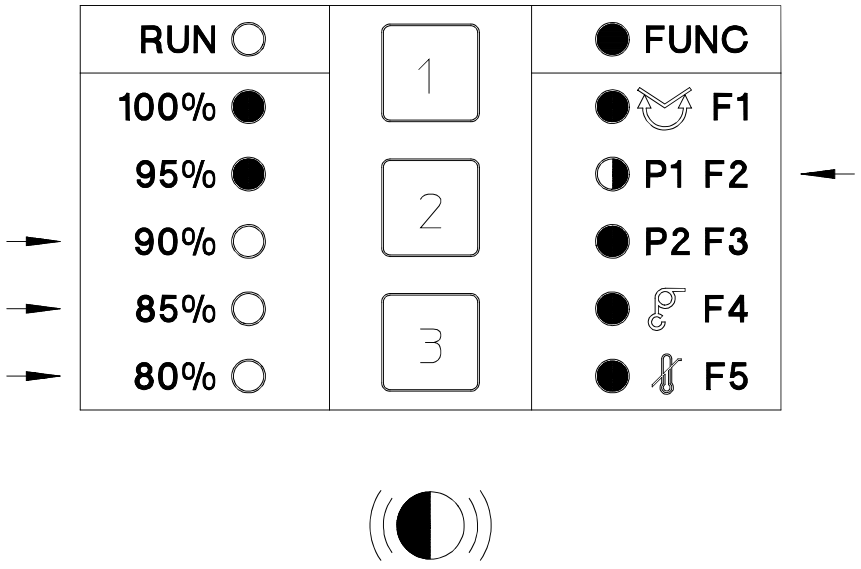
# 6. Signalling during Loader Operation

## 6.1 Load Indication

- During loader operation, the red diodes indicate the load moment in percentage between 80% and 100%.
- When the maximum load moment is between 80% and 100 %, the red diode P1 also flashes.

## 6.2 Indication of 90% Load Moment

- At a load moment of 90%, the red diodes indicating 80%, 85% and 90% are lit.
- The buzzer gives a periodic signal.
- The red diode P1 continues to flash (between 80% and 100%).




The signalling described continues till the load moment gets below 90% again. **Please note: that the diodes do not immediately indicate this reduction of the load moment. A delay has been built into the system to keep the indications of the diodes stable during variation of load.**

## 6.3 Load Moment between 80% and 100%

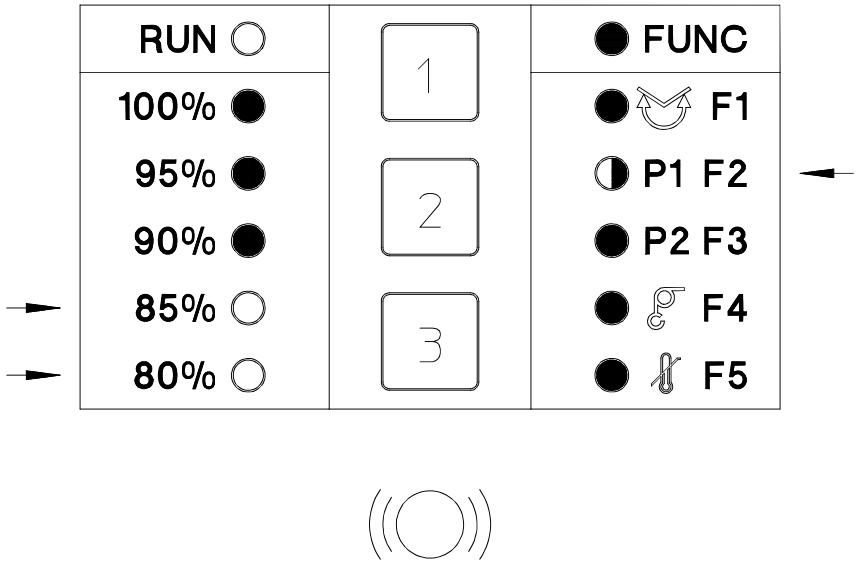
If the loader is fitted with a Fly Jib, the loader and the Fly Jib will rarely have the same load moment.

As to the RCL 5200:

- When the red diode P1 flashes, it means that the *loader* has the largest load moment.
- When the red diode P1 flashes, it means that the *Fly Jib* has the largest load moment.
- The red diodes 80% through 100% are constantly related to either P1 or P2 (the load moment of the loader or the Fly Jib).

Only one of the diodes, P1 or P2 is lit at a time. It will
thus be possible during loader operation to follow whether the loader or the Fly Jib has the largest load moment. This offers the possibility of using the loader/the Fly Jib to its maximum.

Example: The loader has the largest load moment (85%).

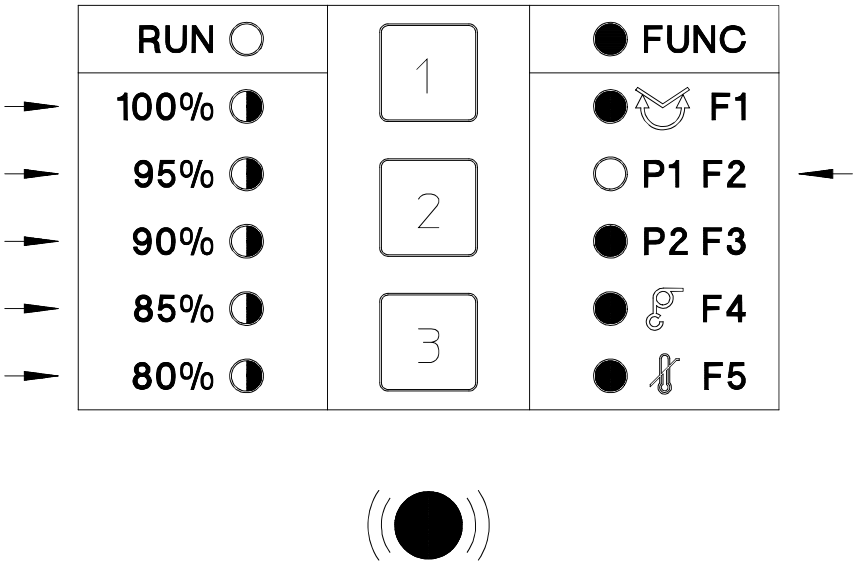


# 7. Signalling in Case of Overload – RCL 5100

The loader's load moment is constantly checked by an SLM (Superior Load Monitoring) safety system, which is activated if the max. permissible load moment of the loader is exceeded.

## 7.1 When the max. load moment is 100%, the controller indicates as follows:

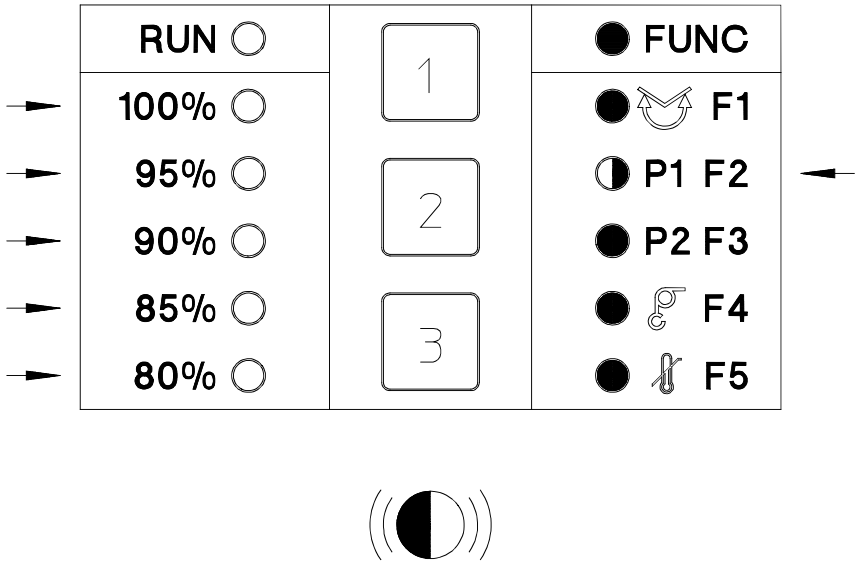
- All red diodes 80% - 100% are flashing (SLM is activated)
- The buzzer gives a constant signal.
- The diode P1 is constantly lit.
- The dump valve opens to tank during a certain period (the dump period), and all loader movements are stopped.




**Please note**: When the max. load moment is 100% and all loader movements are stopped, all control levers must immediately get back into neutral position.

## 7.2 After a short dump period, the controller indicates as follows:

- All red diodes 80% - 100% are constantly lit (SLM is deactivated).
- The buzzer gives an interrupted signal.
- The diode P1 flashes.
- The dump valve closes to tank, and it will be possible to operate the loader again (the movements must be load moment reducing).
- It will however not be possible to operate the loader before the control lever for the boom function (and the slewing function, dependent on optional extras), has been into neutral position.



## 7.3 Erroneous Operation after a Dump Period:

In a situation where the loader can be operated again after a dump period, it will be possible to make load moment increasing movements by making an erroneous operation.

In this case of further overloading of the loader, the SLM safety system will be reactivated and a new and longer dump period will follow (with the diode/buzzer indications as earlier mentioned).

In case of further erroneous operation (overloading) the subsequent dump periods will be increased accordingly.

**Please note!**

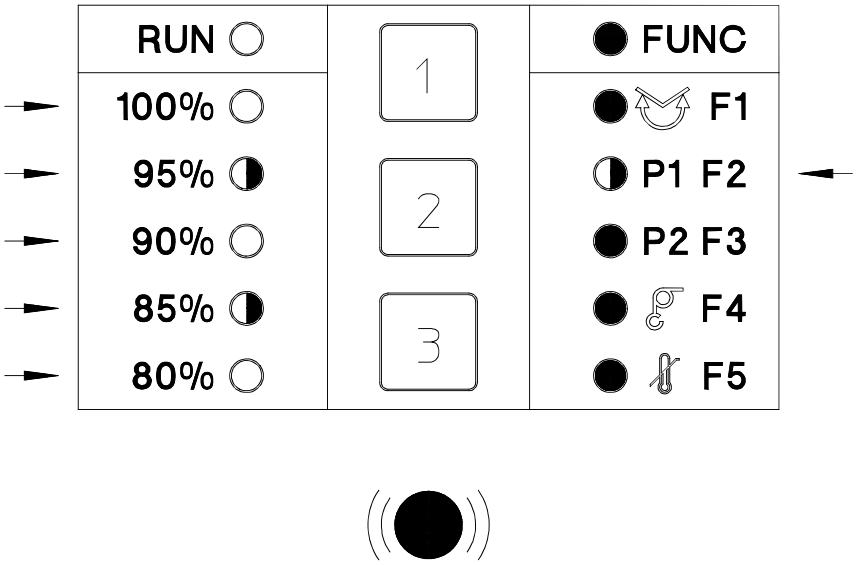
- Abusing the SLM-system to deliberately overload the loader is not permitted.
- The first time a loader movement is stopped by the SLM-system because of overloading, all control levers must immediately get back into neutral position.
- The number of times the loader has been overloaded, how long time it has been overloaded, and how much it has been overloaded, is registered in memory registers. Please see chapter on Registering of Data.
- When the loader is overloaded (the SLM-system is activated), and all loader movements are stopped, the movements must be load moment reducing movements, when the SLM-system is deactivated after a dump period.-

## 7.4 Absolute Stop in Case of Overload

After the loader having been into SLM-stop and then by erroneous operation into a further number of stops (with long dump periods), the SLM-safety system will finally go into an *absolute stop,* and the loader can no longer be operated.

Indication of absolute stop:

- The 85%, 95% and P1 diodes flash.
- The 80%, 90% and 100% diodes are constantly lit.
- The buzzer gives a constant signal.



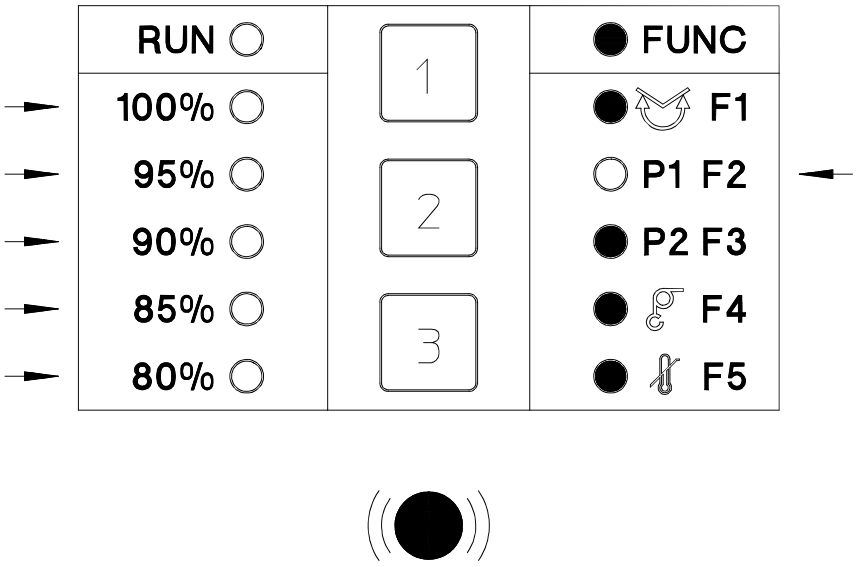

In order to get out of this situation (loader stop), it is necessary to push the *override button*, and at the same time operate load moment reducing movements until the load moment of the loader is below 100%. Afterwards the loader can be operated as usual.
Please also see the chapter on *The Override Function.*

# 8. Signalling in Case of Overload – RCL 5200

The loader's load moment is constantly checked by a TCL (Traditional Capacity Limitation) safety system, which is activated if the max. permissible load moment of the loader is exceeded.

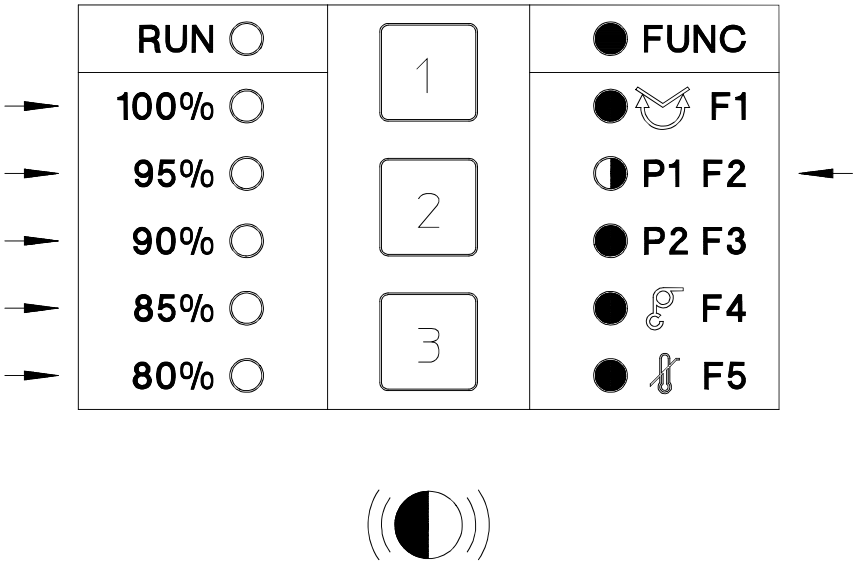
## 8.1 When the max. load moment is 100%, the controller indicates as follows:

- All red diodes 80% - 100% are constantly lit (TCL is activated).
- The buzzer gives a constant signal.
- The diode P1 is constantly lit.
- The dump valve opens to tank and the loader movement causing the overload is stopped.



## 8.2 When all the control valve's levers are back in neutral position again:

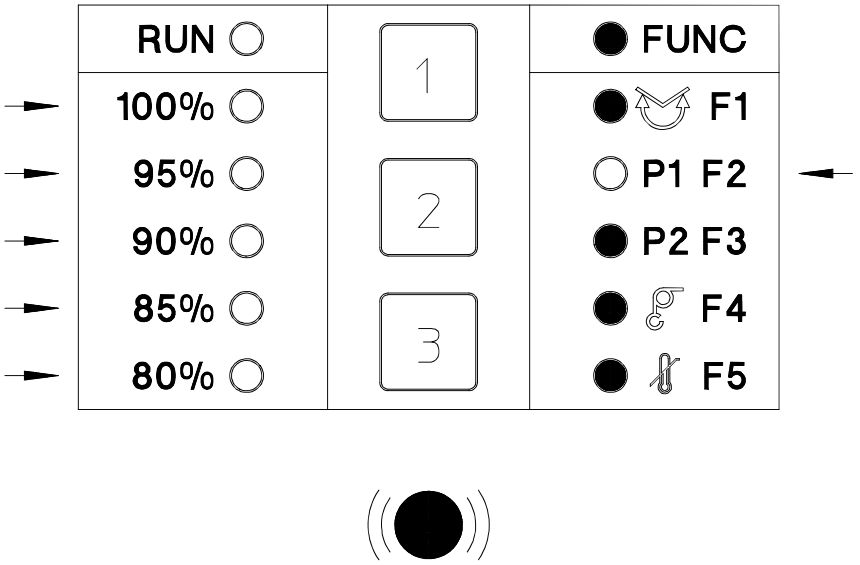
- All red diodes 80% throuch 100% are constantly lit.
- The TCL is deactivated
- The buzzer gives a periodic signal.
- The diode P1 flashes.
- The dump valve closes to tank, and it will be possible to operate load moment reducing movements.



## 8.3 Erroneous Operation after Deactivation of the TCL:

In a situation (after TCL-stop), where a load moment increasing function is operated unintentionally, the controller indicates as follows:

- All red diodes 80% - 100% are constantly lit (TCL is activated again).
- The buzzer gives a constant signal.
- The diode P1 is constantly lit.
- The dump valve opens to tank again until the control valve lever is in neutral position. (Levers for control valve functions which have a spool sensor).



# 9. The Override Function

If the loader is “stuck” in an overload situation, where, for different reasons, it is not possible to make load moment reducing movements, the safety system can be overrided (bypassed) by holding down the red press button and operate the loader to get the loader out of the overload situation.

While holding down the red press button (the buzzer gives a periodic signal), the loader can be operated for 5 seconds, to get the load out of the locked situation, if possible.

If it is not possible to bring the load into a sufficiently favourable position within these 5 seconds, it will be possible – with an interval of 30 seconds – to operate the loader again during 5 seconds.

The 30 seconds non-operational time is only reset after 5 seconds override. I.e. if only 3 seconds are used during the first override period, the controller remembers that the second time, the system is only able to override during 2 seconds.

The override function is also used for “releasing” the main boom (downwards), if it has been operated into its extreme position (vertical position).

After turning on the controller, it takes 30 seconds before the override function can be used.

The override function is only active in connection with overloading.
It does not work in case of a system error.

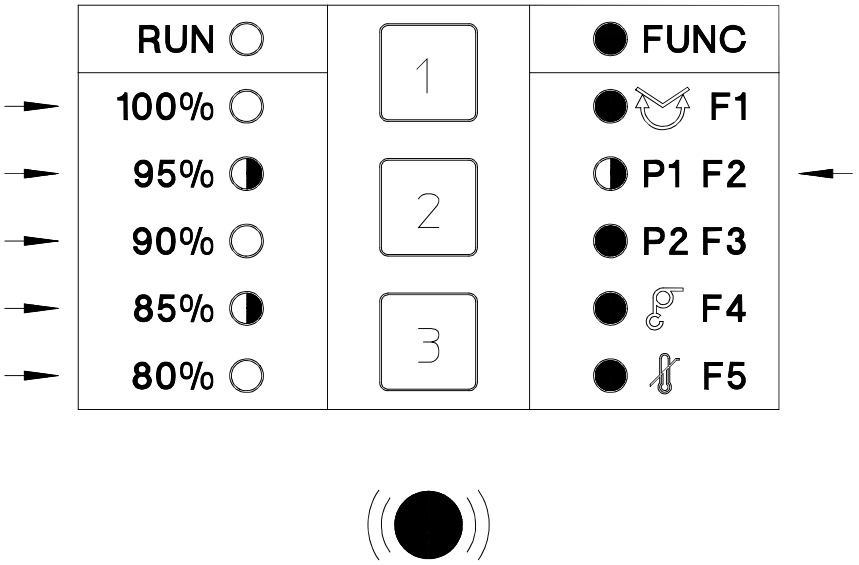
**Please note!**
Abusing the override function is not permitted, as this may lead to very dangerous situations such as for instance unstability of the vehicle or overloading of the loader.
Furthermore, in case of abusing the override function, the SLM safety system will cause a very long dump period (a long non-operational time before the loader can be operated again).

## 10. Absolute Stop in Case of Override

If the loader has been very overloaded as a consequence of using the override function, the safety system will go into an ***absolute stop***, and the loader can no longer be operated.

Indication of absolute stop:

- The 85%, 95% and P1 diodes flash.
- The 80%, 90% and 100% diodes are constantly lit.
- The buzzer gives a constant signal.




In order to get out of this situation, the only possibility is a “last chance” emergency operation. Please see chapter on “Last Chance” Emergency Operation.

Please note!
In case of an error from the pressure transducer (or a short circuit of the signal wire) the safety system can also go into an ***absolute stop***.

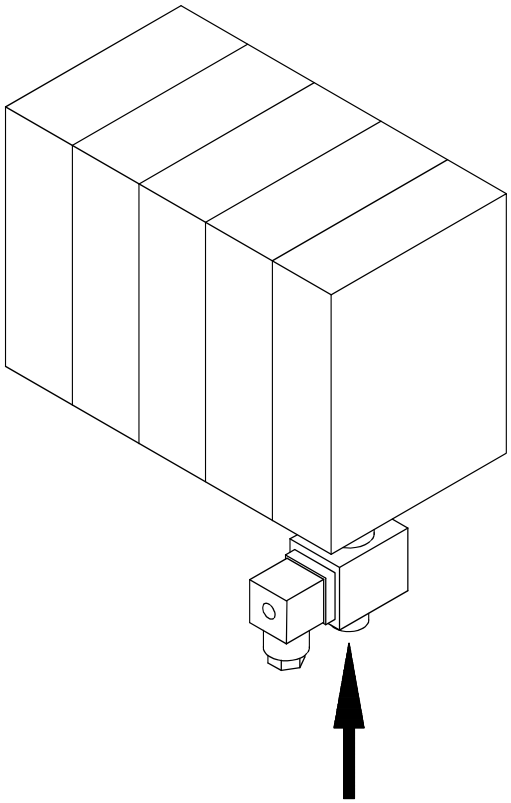
## 11. “Last Chance” Emergency Operation

If, during loader operation, a situation occurs where for example the electric connection between the power supply (the battery of the vehicle) and the controller fails, a manual override push button on the dump valve can be pressed at the same time as the control valve is being operated.

Please note that before pressing the override push button, the seal has to be broken.

This is how emergency operation is made possible, and the loader can be brought out of a dangerous position, if necessary, and then be folded so that the vehicle can drive away.

**Please note!**
Abusing this safety detail is not permitted, it must only be used for emergency operation.
In case of using the manual override function, the button must be sealed again (at an authorised IMT service point).

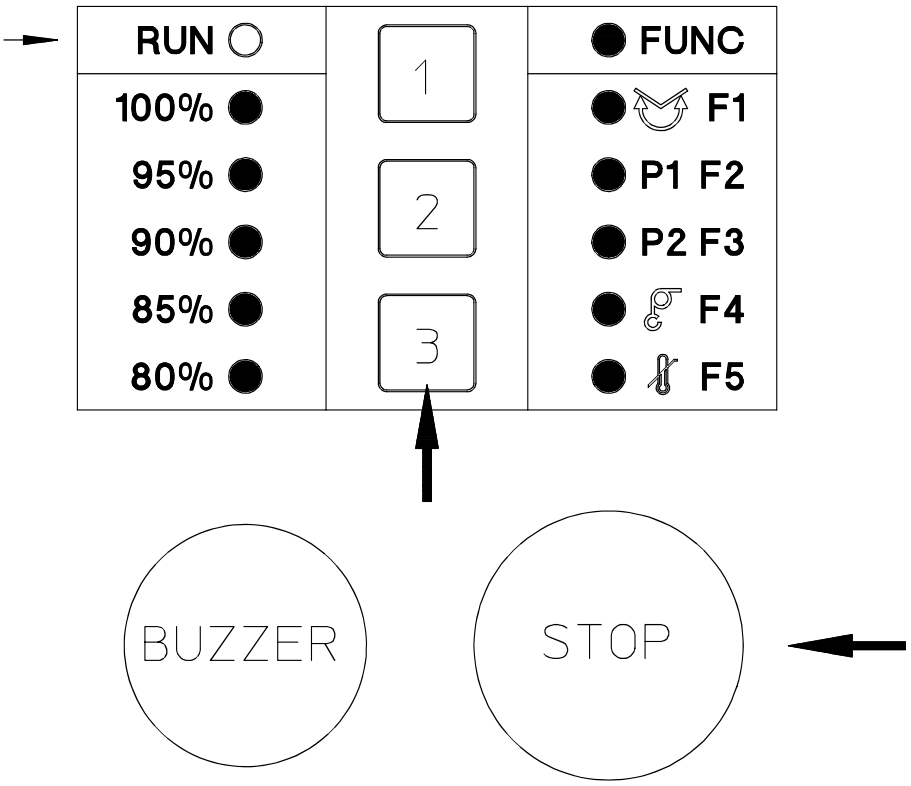


## 12. Emergency Stop

If a dangerous situation occurs, push the stop button. The controller then interrupts the power supply to the loader (the dump valve opens and the oil is led to tank).

Starting up after emergency stop:

- Pull out the stop button.
- Push the green press button.
- The green diode RUN is now constantly lit, indicating that the safety system is ready for operation.



# 13. Supplementary Functions

## 13.1 Disconnection of Buzzer

In cases where loader operation takes place, particularly in the load moment area exceeding 90%, the buzzer will correspondingly give an interrupted signal the most of the time.

The interrupted signal from the buzzer during some time may seem very disturbing, and therefore it is possible to disconnect it.

After the sounding of the buzzer (an interrupted signal) for 5 seconds, it is disconnected by pushing the **green press button.**

From the moment the buzzer changes status (i.e. the load moment gets below 90%), it will automatically go out of disconnection mode again. I.e. if the load moment exceeds 90%, the buzzer will start giving an interrupted signal again.

## 13.2 Registering of Data

The controller has a black box-function currently registering data in memory registers, i.e. information on load moment, operation, function and service conditions.

The information is read by connecting either a service terminal or a PC during the annual service overhaul at an IMT service point.

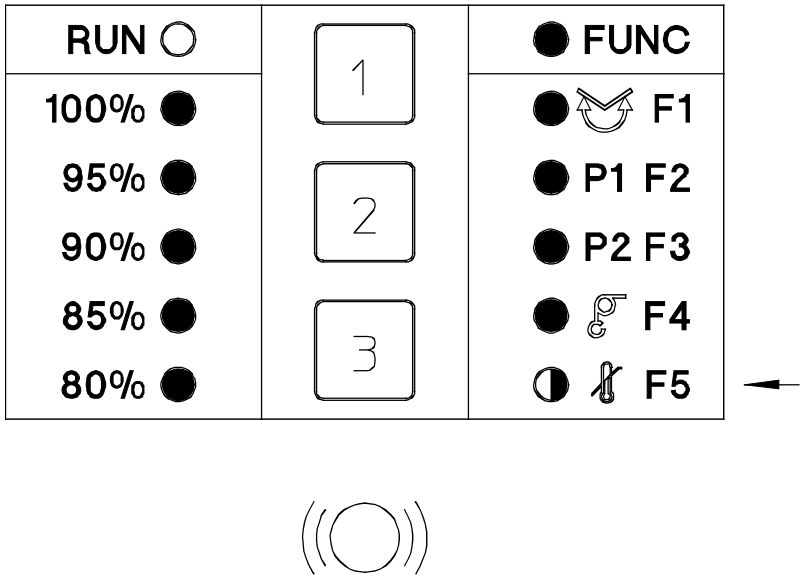
## 14. Oil Temperature Monitoring (RCL 5200)

By connection of a temperature sensor (fitted in the tank connection), the RCL 5200 controller can check the temperature of the hydraulic oil.

### 14.1 Warning at High Oil Temperature

If the max. permissible operation temperature of the oil is exceeded, the controller indicates as follows:

- The diode for oil temperature flashes.

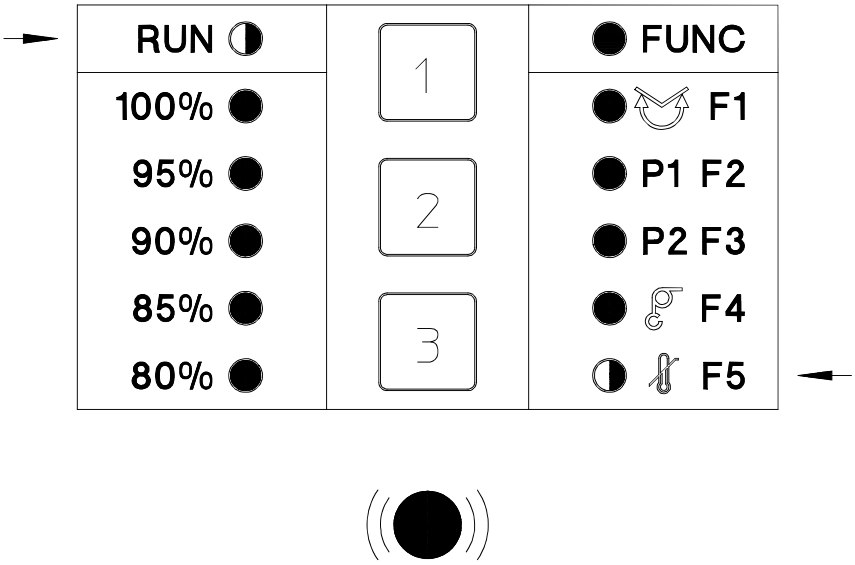


## 14.2 Stop of Loader in Case of Critically High Oil Temperature

If the oil temperature increases further, the controller interferes and stops the loader before the oil is superheated and damages the hydraulic system.

In case of loader stop the following is indicated:

- The RUN diode flashes.
- The RUN diode flashes.
- The buzzer gives a constant signal.
- The dump valve opens to tank and the loader stops.




Please also see chapter on Troubleshooting regarding indication.

Loader operation cannot be started again until the oil has been sufficently cooled. I.e. after the pump circuit has been running for some time and the RUN diode no longer flashes.

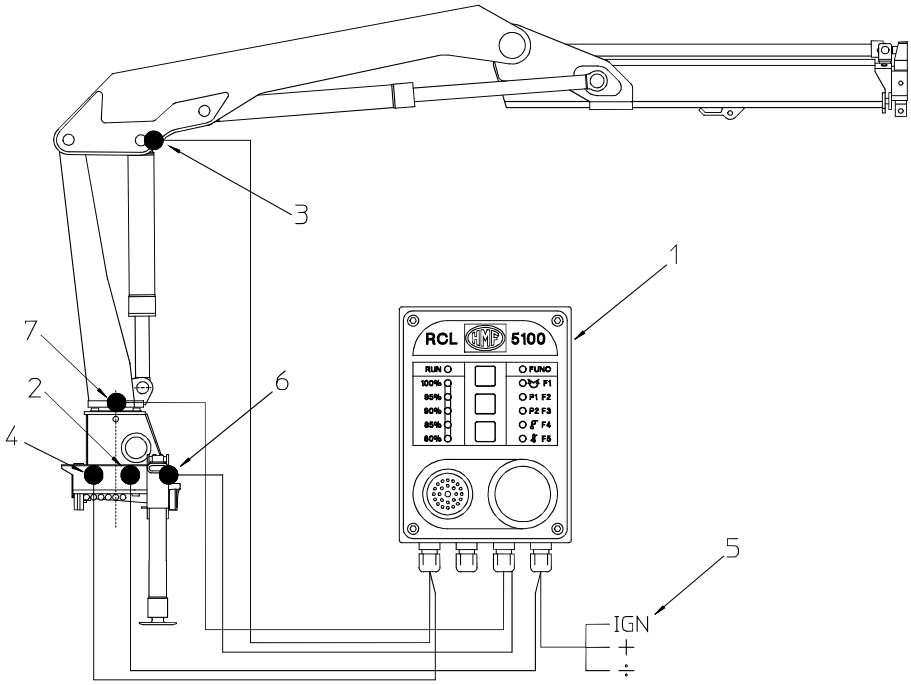
# 15. 2-Stage Load Moment Limitation (LMB)

## 15.1 The Safety System

If the vehicle is not stable in the entire slewing area of the loader (for example in front of the driver's cab), the RCL safety system is extended with a 2-stage load moment limitation (LMB).

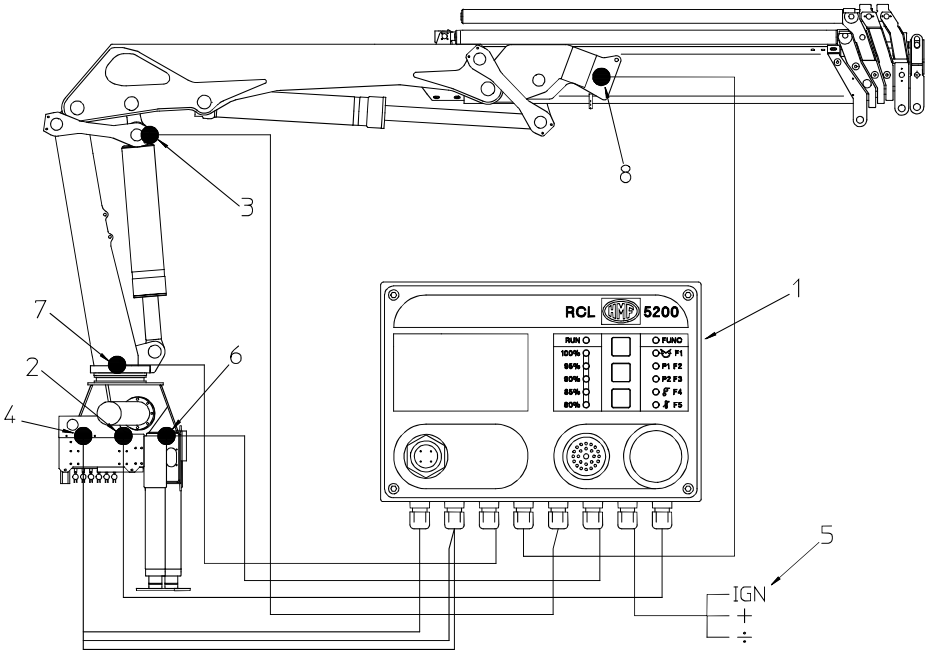
The 2-stage LMB ensures that the lifting capacity of the loader is reduced in the slewing area where the vehicle is unstable.

## 15.2 Configuration – RCL 5100, 2-Stage LMB



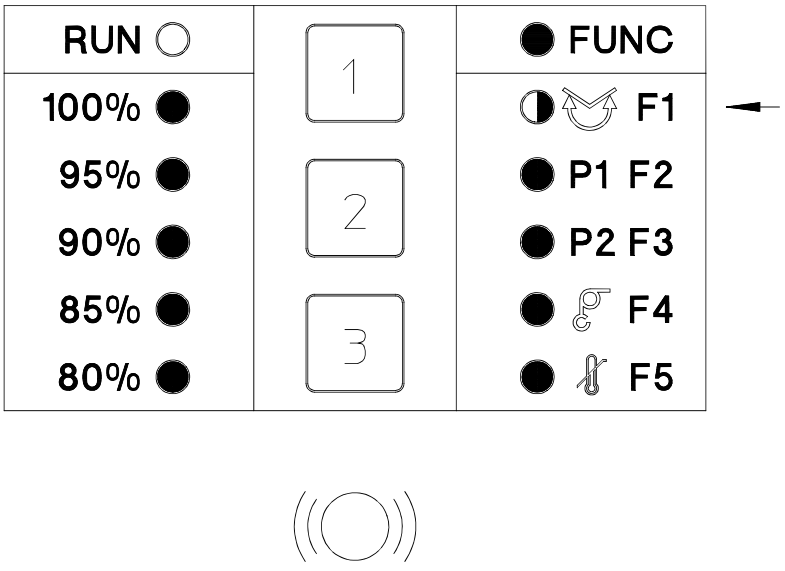

1: RCL controller
2: Dump valve
3: Pressure transducer
4: Spool sensors
5: Power supply
6: External stop button
7: Proximity switch
8: Mercury switch

## 15.3 Configuration – RCL 5200, 2-Stage LMB



## 15.4 Working in the Stable Slewing Area

- If working with a load moment lower than the capacity in the unstable area, no indication will occur on the controller.
- If working with a load moment higher than the capacity in the unstable area, the controller will indicate as follows: the diode with the slewing limitation symbol flashes and warns the operator of the slewing movement being stopped, if this movement gets into the unstable area.

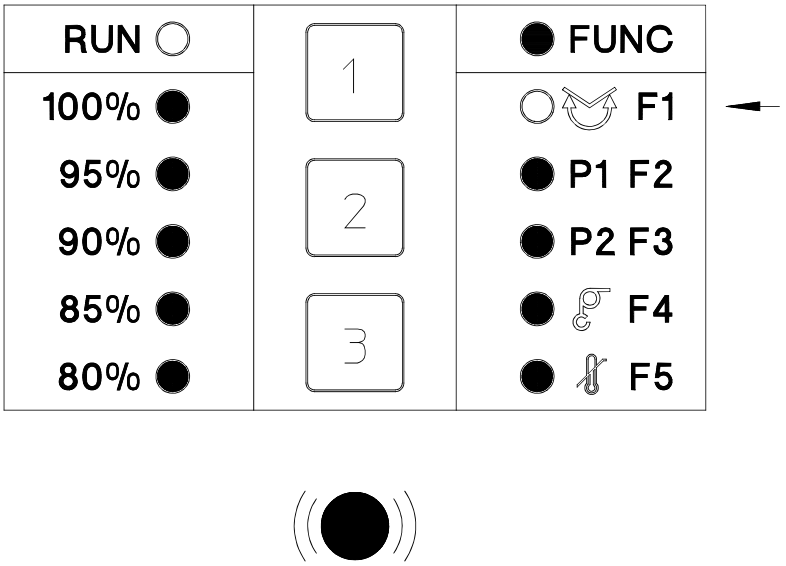


## 15.5 Slewing with a too Large Load Moment towards the Unstable Area

If, (despite the warning) the slewing movement has a too large load moment from the stable to the unstable area, the slewing movement will be stopped and the controller indicates as follows:

- The diode with the slewing limitation symbol is constantly lit.
- The buzzer gives a constant signal.
- The dump valve opens to tank (the slewing movement is stopped).

To be able to move into the unstable slewing area, the load moment should now be reduced to the capacity in this area.



## 15.6 Working in the Unstable Slewing Area

If working with the loader in the unstable slewing area, the monitoring of the load moment functions exactly as in the stable area, but the max. permissible load moment is reduced.

I.e. the diode/buzzer indications function as normal but at a lower level (indication with the 100% diode means that the load moment is at the max. permissible limit corresponding to the capacity in the unstable area).

# 16. EVS-Electronic Vehicle Stability

## 16.1 The EVS system

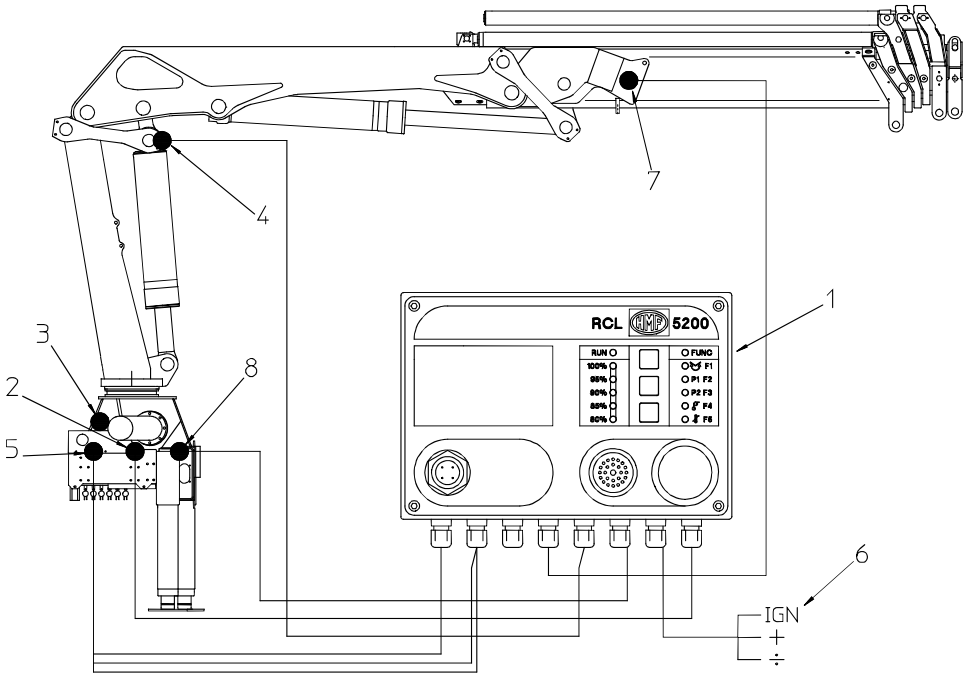
As described in the beginning of this instruction manual, the main purpose of the RCL safety system is to ensure that the loader's max. permissible load moment is not exceeded.

The EVS (Electronic Vehicle Stability) is a load dependent system, which is monitoring and securing the stability of the vehicle during loader operation in the critical working areas.

Generally the loader's max. load moment cannot be utilized in the entire working area, due to lacking stability of the vehicle.
If the loader is equipped with an EVS system, its lifting capacity can constantly be utilized to its max. limit in relation to the stability of the vehicle.

By loading the vehicle in the right way, i.e. placing the first burdens so that their weight increases the stability of the vehicle, it will be possible to obtain sufficient stability for utilizing a larger part of the loader's load moment.
In other words, the loader's load moment is constantly adapted up to the limit of the vehicle's stability, no matter where in the working area the lifting movement is carried out.

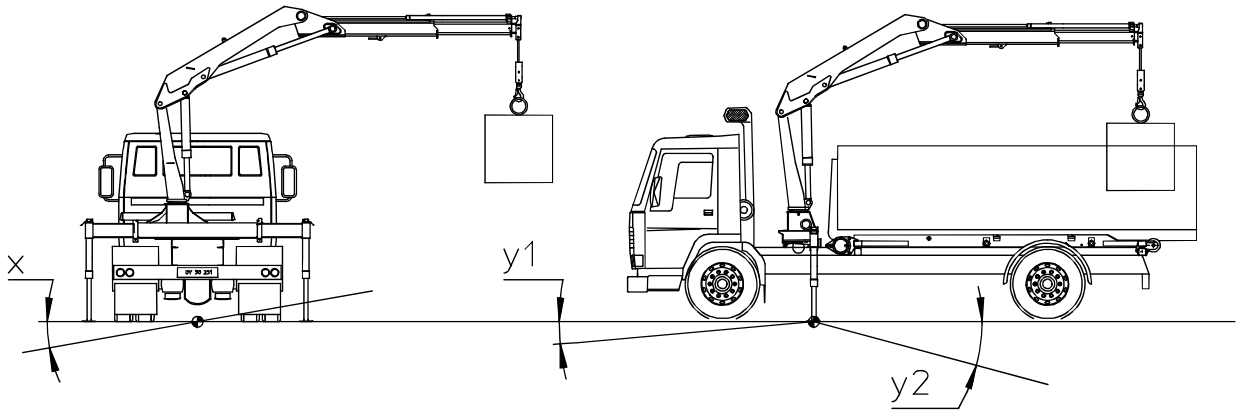
## 16.2 Configuration of the System




1: RCL 5200 controller
2: Dump valve
3: AIC-unit
4: Pressure transducer
5: Spool sensors (Slewing, Boom, Jib, Extension)
6: Power supply
7: Mercury switch
8. External stop button

## 16.3 Mode of Operation of the EVS System

The AIC-unit (Advanced Inclination Controller) is fitted to the base of the loader and has two built-in heel sensors, measuring the heel of the vehicle to the left and right (X-direction), to the front (Y1-direction), and to the back (Y2-direction).




During loader operation the AIC-unit is thus constantly monitoring the heel of the vehicle.
When the heel reaches a marginal value, i.e. when the vehicle starts being unstable, a signal from the AIC-unit is sent to the RCL 5200 safety system.

In the same way as the loader's load moment increasing movements are stopped because of overloading (Load Moment Limitation – LMB), the RCL system reacts in case of too much heel and stops the stability reducing loader movements (Electronic Vehicle Stability – EVS).
Also a slewing movement registered as a stability reducing movement will be stopped.
All stability increasing loader movements can still be operated.

The safety system will interfere in the following sequence:

- The heel reaches the marginal value
- The marginal value of the heeling is registered by the AIC-unit
- The AIC-unit sends a signal to the RCL controller
- The EVS system stops the stability reducing loader movements

## 16.4 Load Moment Limitation (LMB) and Electronic Vehicle Stability (EVS)

Load moment limitation (LMB) and Electronic Vehicle Stability (EVS) is an integrated safety system controlled by the RCL controller.

If the loader is equipped with an EVS system (option), two types of interfering can be experienced during loader operation, if a critical situation occurs:

1. The load moment of the loader is at the *max. permissible limit* and the LMB is activated.
   or
2. The loader has stressed the vehicle to the *max. permissible heel limit* and the EVS is activated.

No matter which of the two systems are activated, the load moment increasing or stability reducing movements are stopped (the dump valve opens so that the oil from the pump flows to tank).

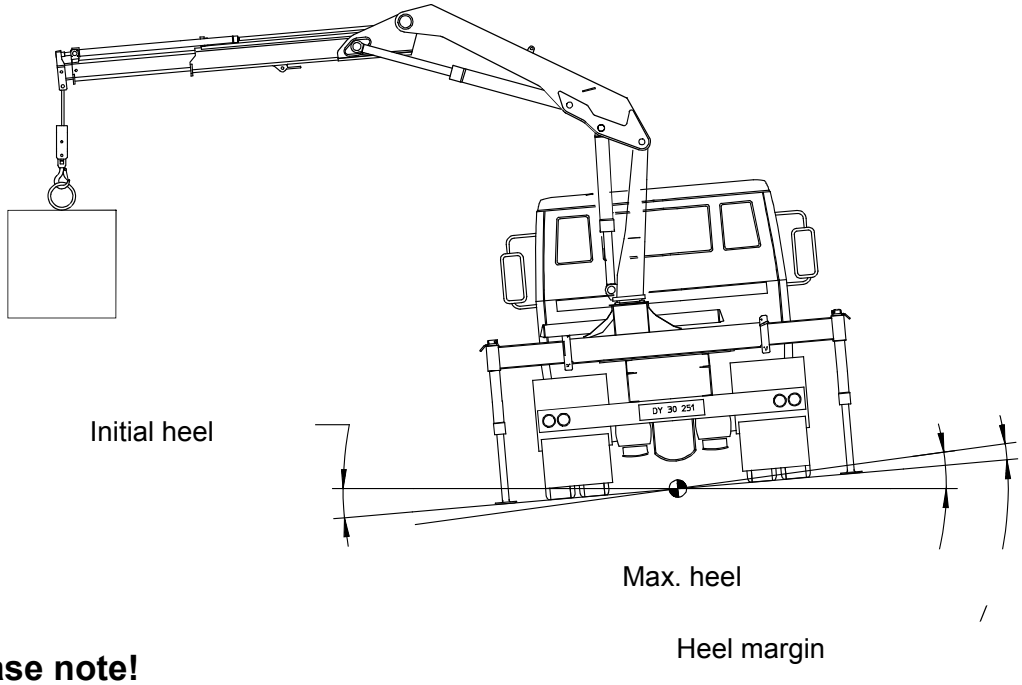
Load moment reducing or stability increasing functions can be operated freely (the dump valve closes so that the oil from the pump can flow to the loader cylinders).

## 16.5 Calibration of the EVS system

The ground is not always completely horizontal where loader operation takes place. Also, the vehicle is not in horizontal position and has thus a so-called *initial heel.*

The AIC-unit registers the heel of the vehicle during loader operation. The loader's load moment can make the vehicle heel up to a max. marginal value called the *heel margin*.

The total heel, i.e. the *initial heel* plus the *heel margin* must not exceed a marginal value called the *max*. *heel*.




**Please note!**
The *max. heel* is pre-set at 5 degrees (depending on the vehicle). I.e., if the vehicle heels a lot so that the *max*. *heel* exceeds 5 degrees, the RCL system and thereby the loader cannot be activated.

In any case of starting up loader operation, the vehicle will as a starting point heel a little bit and thus have an *initial heel*, which is registered by the AIC-unit.

When starting up the RCL system a *calibration* has to be carried out in order to zeroize the heel, which the AIC-unit has registered.

### 16.5.1 Calibration when starting up

When starting up loader operation, after having extended the stabilizers and lowered the stabilizer legs, the vehicle is not in horizontal position but has an *initial heel.* To ensure that the EVS system can function correctly, the initial heel has to be zeroized, i.e. the current registered angle of heel is set at zero degrees.

When starting up the RCL-system, the AIC-unit registers the initial heel of the vehicle. Provided that the load moment of the loader is less than approx. 25% (depending on the design of the loader and the loader equipment), the system carries out an automatic *calibration*, i.e. zeroizing of the initial heel.

When the system has been calibrated, the buzzer confirms by 3 beeps.

During loader operation to both sides of the vehicle, it will be an advantage if the EVS system calibrates at as low a load moment as possible. The best possible calibration is obtained when the loader is folded in stowing position during start up. Please see chapter on “Optimisation of Calibration”.

If the load moment exceeds approx. 25% when the RCL system is started up, the system does not carry out any calibration and the loader is derated. I.e. the loader can only be loaded up to the level where the vehicle is stable in the entire slewing area of the loader.

### 16.5.2 Automatic Calibration

During loader operation, the EVS system will try to optimize the calibration. Each time the load on the loader gets below the level where it was last calibrated, a new calibration is carried out.

Each time the system calibrates, the buzzer confirms by 3 beeps.

### 16.5.3 Calibration during Loader Operation

During loader operation, three situations may occur, causing the EVS system to carry out a new calibration:

1. In case of electric changing over to stabilizer operation
2. In case of manual changing over to stabilizer operation
3. In case of a stabilizer leg sinking into the surface

Re.: item 1
If the loader has an electric change over between the loader functions and the stabilizer functions, and the operator has operated the stabilizer (push the yellow press button twice), the system will calibrate again at the moment where a loader function is operated. Please see chapter on Start Up Procedure.

Re.: item 2
If the loader has a manual change over (ball valve) between the loader functions and the stabilizer functions, and the operator has operated the stabilizer, the system will calibrate again at the moment where a loader function is operated.
The calibration is only carried out, if the heel of the vehicle has changed more than 50% of the max. permissible heel (heel margin), and at the same time the load on the loader is below approx. 25%.

Re.: item 3
If, during loader operation, a situation occurs where a stabilizer leg sinks a bit into the ground, the heel of the vehicle will change, and this will be registered by the EVS system as beginning instability. In this way the loader's lifting capacity can only be utilized corresponding to the reduced stability.

If the heel of the vehicle exceeds the marginal value for instability as a consequence of a stabilizer leg sinking a bit into the surface, all loader movements are stopped for 4 seconds. After this, only stability increasing loader movements can be operated.

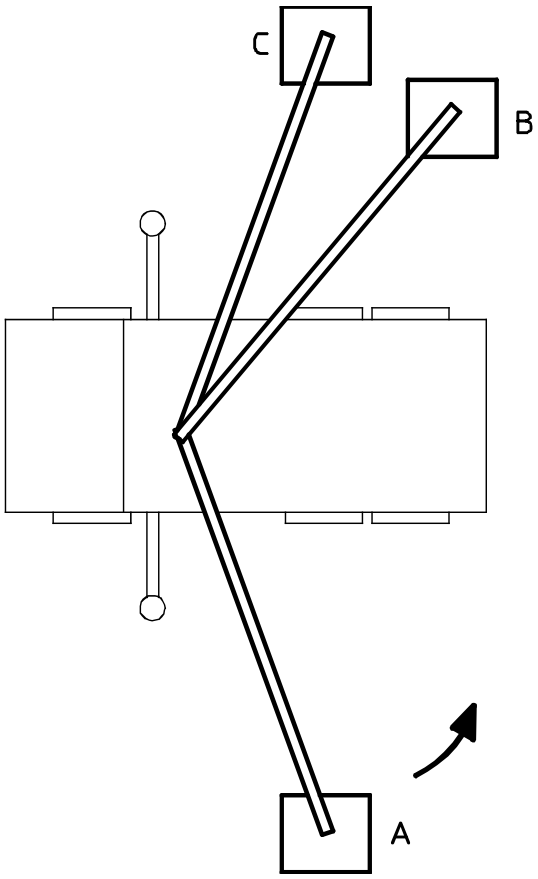
Now the load has to be placed on the ground or moved in the direction towards the vehicle (stability increasing direction). Afterwards a new calibration is carried out.

**Please note!**
Whether the loader has a manual or electric reverser between the loader and stabilizer functions, it is necessary to push the yellow press button on the RCL

indicator panel twice (or the remote control box) before operating the stabilizer functions.

### 16.5.4 Optimisation of Calibration

If the working tasks demand slewing a load from one side of the vehicle to the other, asymmetric stability might occur.
I.e., if a load is to be moved from point A to point C in the opposite side, the EVS system might be activated and the slewing movement stopped already in point B.




In such a working situation it is necessary to optimise the calibration, i.e. the EVS system calibrates at as low a load moment as possible.

Optimal calibration at a low load moment on the loader is carried out as follows:

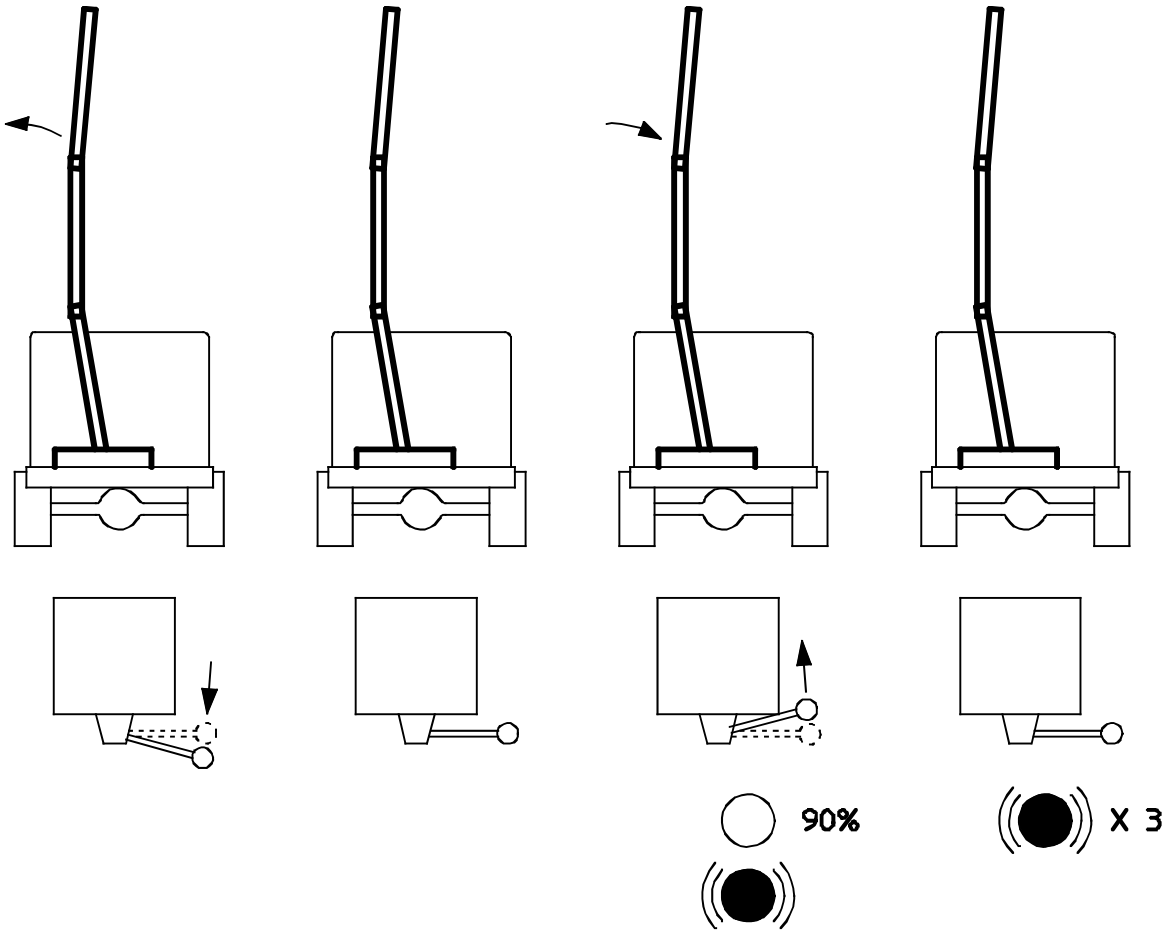
- When the loader is folded in stowing position
- When the boom system is raised into vertical position

The 80, 85, 90, 95, and 100% diodes on the RCL indicator panel indicate, right before the calibration is carried out, the size of the current load moment on the loader:

- The 80% diode indicates the worst calibration (at the highest load moment)
- The 100% diode indicates the best calibration (at the lowest load moment)

Example of optimisation of calibration:

- There is no load on the hook
- Raise the boom into vertical position to a position where the load moment is estimated to be low, and put the levers of the valve block into neutral position.
- If the load moment in this position is lower than at the previous calibration, a diode indicates the current load moment at the moment when you operate a loader movement again (e.g. boom down).
- E.g. if the 90% diode is lit and the buzzer gives a constant signal for as long as the lever is kept in this position. The loader does not move. A constant signal from the buzzer indicates that the dump valve opens and the oil flows to tank.
- The new, improved calibration is being carried out at the moment when the levers of the valve block are back in neutral position.
- When the calibration has been carried out, the buzzer confirms by 3 beeps.
- Then loader operation can start.



If you want to improve the calibration further, repeat the procedure by moving the boom close to vertical position. With this boom position the load moment of the loader is low and the best possible calibration can be obtained. This is indicated by the 100% diode being lit.

Please note:
The main boom must not be completely raised and extended to its extreme position. In this case the hydraulic system will build up a high pressure, which is registered as a high load moment by the RCL/EVS system. Therefore the EVS system will not carry out any calibration.

### 16.5.5 Manual Calibration

During loader operation it is possible to carry out *manual calibration.* E.g. if you want an optimisation of the calibration. Please see previous chapter.

Provided that the load moment of the loader is less than approx. 25%, a *manual calibration* can be carried out when pushing first the yellow and then the green press button on the RCL indicator panel.

Now one of the 80, 85, 90, 95, or 100% diodes on the RCL indicator panel indicate the size of the current load moment on the loader.
Please see chapter on “Optimisation of Calibration”.

At the first activation of one of the levers of the valve block, the buzzer gives a constant signal, indicating that the dump valve opens and the oil flows to tank. The loader does not move.

When the lever is moved into neutral position, the system calibrates, and the buzzer confirms by 3 beeps. During 5 seconds one of the %-diodes indicates how optimal the calibration was that has just been carried through (100% is the best possible calibration).

Then loader operation can start.

## 16.6 Starting Up of the Loader

Before starting up, the essential safety regulations have to be respected, just as the general procedure in connection with starting up of the loader has to be followed. Please see the *Instruction Manual* of the loader.

Especially during the *starting up procedure* it is important that the vehicle is stabilized correctly, when the stabilizer legs are lowered to the ground.
This is to ensure that the loader can lift the max. permissible load without the vehicle's heel reaches the marginal value, and the EVS system is activated.

### 16.6.1 Starting Up Procedure

Before starting up, the operator must carry out the following:

- If the vehicle is air-sprung, the air bellows have to be bled.
- Connect the pump (PTO); the controller is thus powered.
- Push the green press button on the RCL indicator panel.
- The RUN diode is now constantly lit and the RCL-safety system is activated.
- Push the yellow press button *twice* to choose the stabilizer function
- Extend the stabilizer beams and lower the stabilizer legs (with plates under the footplates, if necessary) until the chassis of the vehicle is lifted approx. 5 cm.
- Activate one of the levers of the valve block to unfold the loader from its stowing position.
- A diode* (e.g. the 85% diode) is lit and the buzzer gives a constant signal for as long as the lever is kept in this position. The loader does not move.
- Move the lever of the valve block into neutral position, after which the EVS system is calibrating.
- When the calibration has been carried out, the buzzer confirms by 3 beeps.
- Then loader operation can start.

∗ The diode states how well the EVS system is calibrated. Please see chapter on "Optimisation of Calibration".

- If the loader does not have an electric change over for operating the stabilizer functions, the procedure is the same (also in this case push the yellow press button twice), however, change over manually by means of a ball valve.

## 16.7 Signalling during Loader Operation

During loader operation, there will be different indications of the diodes and different signals from the buzzer.

The different indications will state whether it is the load moment limitation (LMB) or the heel of the vehicle (EVS) that causes the interference from the RCL safety system.

Indication in connection with LMB is described previously in this manual.

In connection with EVS, the diode with the slewing symbol, the diode P1 and the buzzer indicate as follows:

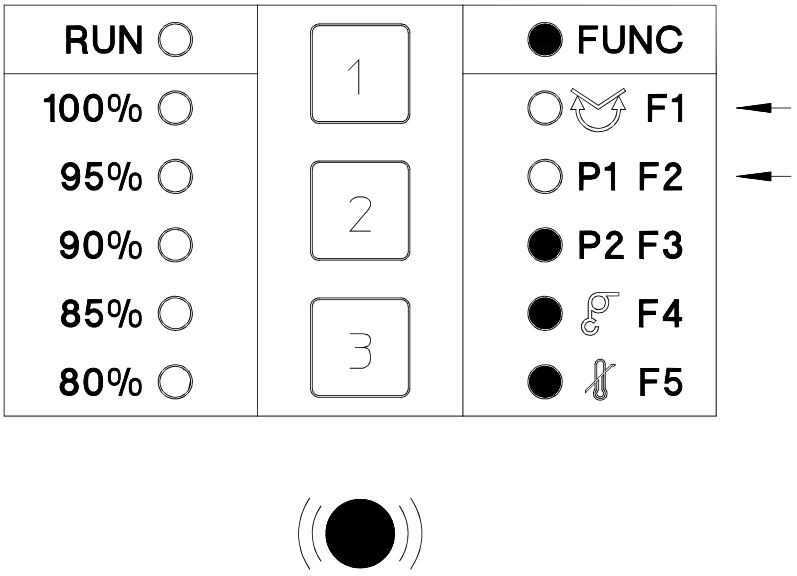
- The slewing symbol and the P1 diode flashing as well as an interrupted signal from the buzzer indicate: The heel of the vehicle has exceeded the max. permissible limit (the heel margin).

- The slewing symbol and the P1 diode constantly lit as well as a constant signal from the buzzer indicate: The loader is stopped (the dump valve opens so that the oil from the pump flows to tank).

## 16.7.1 Signalling in Case of too much Heel

Example:
If, during loader operation a heavy burden is moved from the truck body and over the side, the heel of the vehicle will increase. If the heel exceeds the max. permissible limit where the vehicle becomes unstable (heel margin), the following is indicated:

- The 80 through 100% diodes are constantly lit.
- The slewing stop symbol and the P1 diode are constantly lit.
- The buzzer gives a constant signal.
- The dump valve opens to tank during 4 seconds (the dump period), and *all loader movements are stopped*.



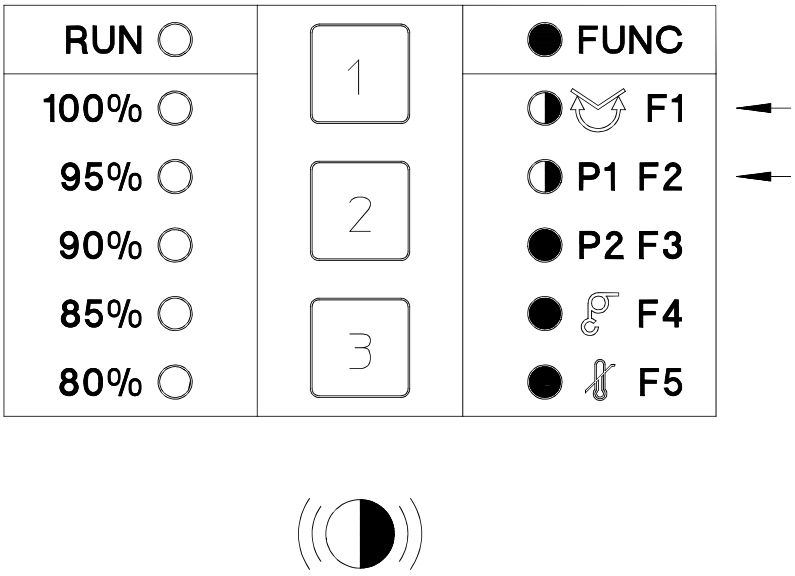

Indication of a load moment of 100% means that the lifting capacity of the loader has been reduced (derated) to the lifting capacity of the loader at the moment when the loader was stopped.

Any other kind of loader function, which in the same way makes the heel of the vehicle exceed the max. permissible limit of unstability, entails the same loader stop as in the above example.

**After Loader Stop:**

The load becomes steady thanks to the loader stop and after 4 seconds, the following is indicated:

- The 80 through 100% diodes are constantly lit.
- The slewing stop symbol and the P1 diode are flashing.
- The buzzer gives an interrupted signal.

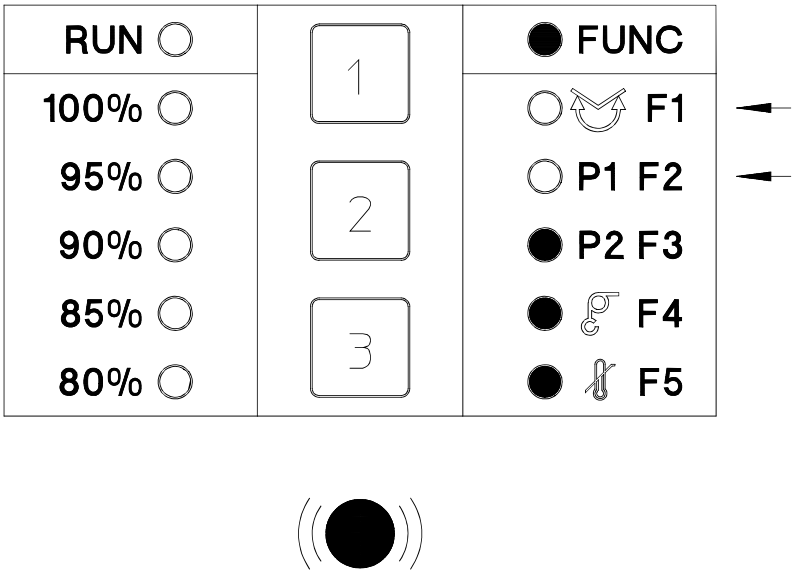



By stopping the loader, the EVS system warns the operator of the vehicle starting to become instable and that stability increasing loader movements have to be operated.

**Please note!** In case of loader stop in certain positions, it might be necessary to operate stability increasing movements by for instance the “extension retract” movement up to one metre, before the EVS system is deacitivated, thus allowing normal lifting capacity.
This is due to the chassis’ slowness to “draw itself up” after heeling (hysteresis).

If, after a loader stop, the operator accidentally operates a lever for a stability reducing loader movement, the following is indicated:

- The 80 through 100% diodes are constantly lit.
- The slewing symbol and the P1 diode are constantly lit.
- The buzzer gives a constant signal.
- The dump valve opens to tank.




The EVS system intervenes against the erroneous operation, and the loader never gets to move.

## 16.8 Especially for Loaders equipped with HDL

When a loader is working in HDL-mode the working speed is reduced to approx. 20% of the loader's normal speed.

This principle is utilized in connection with the EVS system.

When the heel of the vehicle is 70% of the max. permissible limit (the heel margin), the HDL is activated, and the working speed of the loader reduced.

This function indicates that there will soon be a loader stop. Furthermore this is to ensure a "soft stop" thanks to the reduced speed, which is an advantage, in particular in case of a slewing movement.

Please see chapter on HDL.

## 16.9 Override and EVS

If the loader is "stuck" in a position, where it is not possible to make stability increasing movements, the EVS system can be overrided (bypassed) when pushing the red press button on the RCL indicator panel.

In case of for instance a very fast slewing movement with a heavy load, the loader is stopped because the EVS system is activated – this overload might entail that it is not possible to make a slewing movement back into a stability increasing direction.

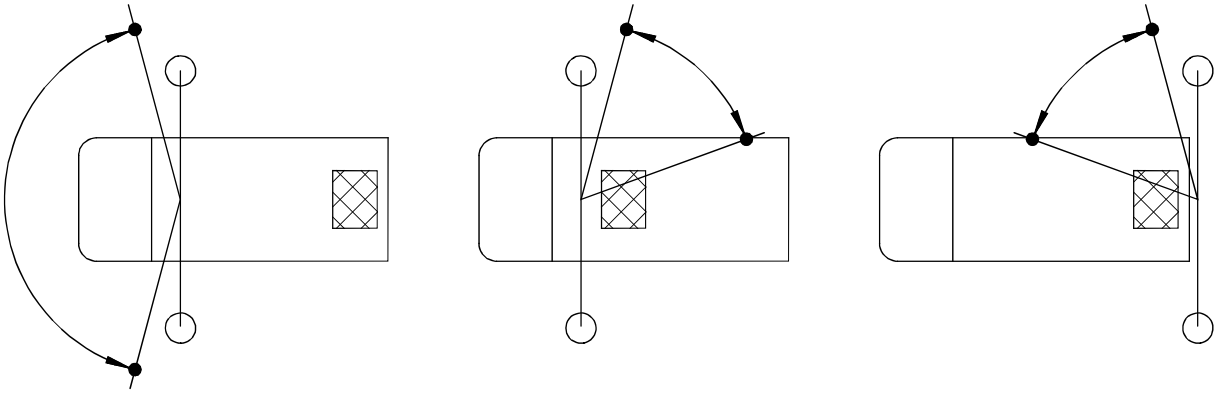
In this situation it is possible to hold down the red press button and the loader can thus be operated for 5 seconds.

Please also see description of the Override Function previously in this manual.

**Please note!**
Consider thoroughly the next movement/s and operate the loader carefully, when the override function is used.
Be careful not to operate a stability reducing function by mistake when using the override function.

## 16.10 Good Advice for Unproblematic Operation of the Loader

- Always extend stabilizer beams completely to obtain max. stability of the vehicle.
- Make certain that the ground is sufficiently firm and that there is no risk of a stabilizer leg being able to break through for instance a frozen layer on the ground.
- Always use plates under the footplates of the stabilizer legs, when necessary.
- If a stabilizer leg sinks a bit into the ground during loader operation, the calibration becomes incorrect.
- To obtain max. lifting capacity, it is necessary to carry out a new calibration of the EVS system. Please see chapter on “Calibration of the EVS system”.
- Always drive as close to the load to be lifted as possible.
- Make lifting movements with the main boom as close to horizontal as possible (the boom position where the loader has its max. load moment).
- Generally operate the loader movements in a calm and considerate way, in particular getting near the critical heel of the vehicle.
- Always operate the loader slowly when moving a burden at a long reach.
- Always consider that it increases the vehicle stability if the load is placed in the right place when starting the loading work.



## 16.11 Warning

- If for example a stabilizer leg sinks into the ground, entailing the risk of the vehicle overturning:

    - Drive the load closer to the vehicle. Even though the EVS system is activated, the “extension retract”-function can always be operated.
    - If the jib extension is retracted, and the slewing movement cannot be operated, use the override function to get out of the situation.
    - When starting up again, then follow the *starting up procedure* again.

- Abusing the override function is not permitted, as this may lead to very dangerous situations.
- Avoid inappropriate use of the loader, e.g. fast loader movements with the load at a long reach.
- Avoid oscillation of the load during loader operation, especially when the load is in a long sling, or when working with winch and a long wire rope.
- Operate the loader carefully when the vehicle is empty. Peak loads might occur and thereby activation of the EVS system.
- Avoid slewing a load quickly from one side of the vehicle to the other. Loader stop might occur, due to the fact that the EVS system has not been calibrated in the best possible way. Please see chapter on “Optimisation of Calibration”.

# 17. Safety System, Stand-Up Controls, HS

## 17.1 The Safety System

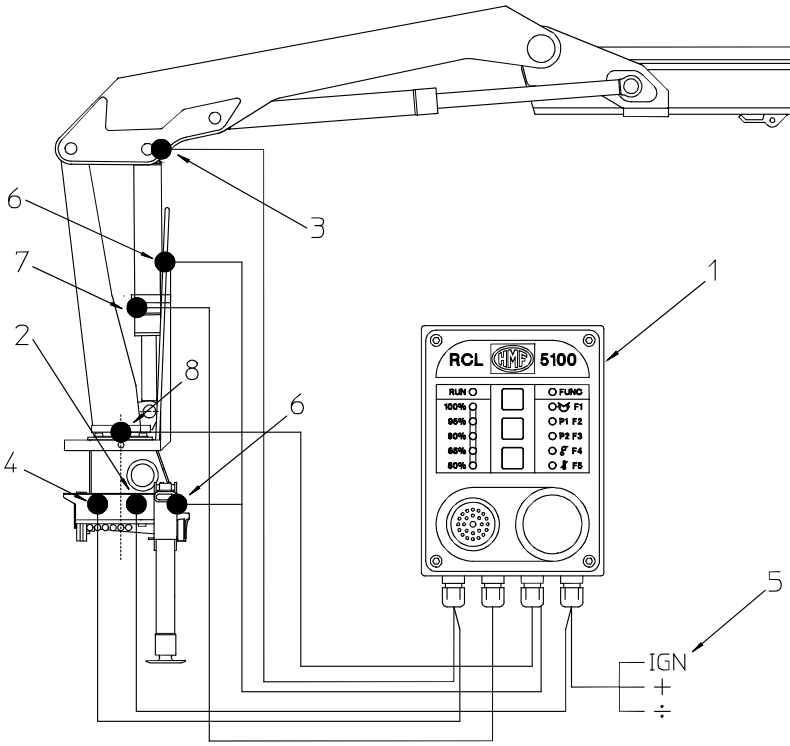
If the loader is fitted with stand-up controls (HS), the RCL safety system is extended with one of the following systems dependent on the country to which the loader is to be delivered:

- **Slewing limitation, stand-up controls**
- **Warning during slewing movement over stand-up controls**

The safety system must protect the operator against being pinned by the boom, when he operates the loader from the stand-up platform.

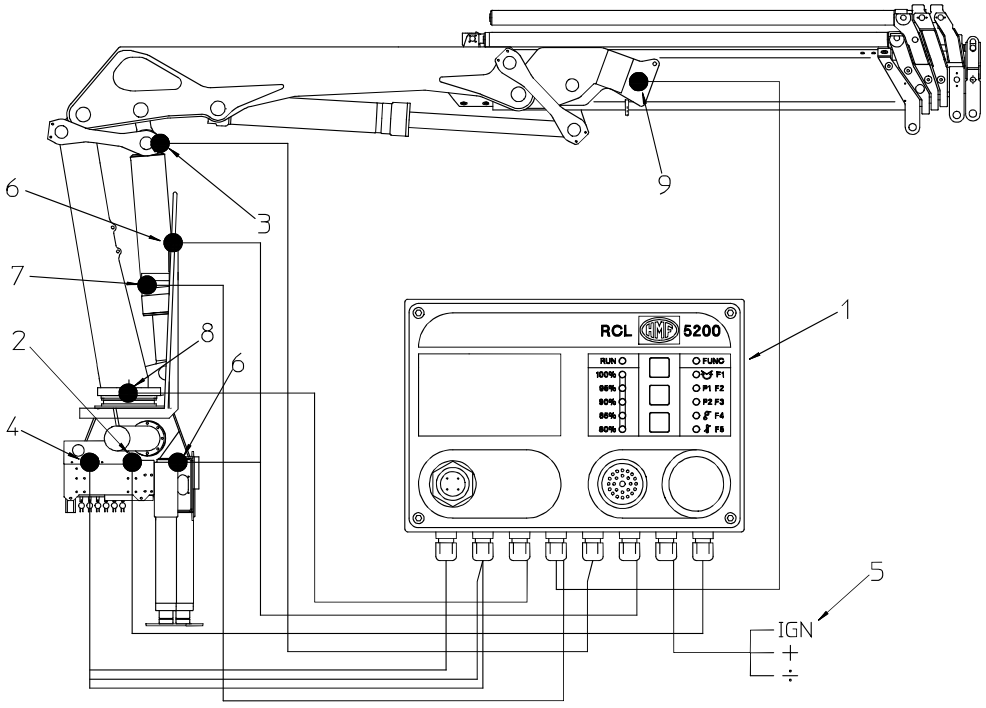
If the operator stands on the ground operating the loader, this safety system is not activated, and the slewing movement can be operated freely, provided that the vehicle is stable (please see chapter on 2-stage load moment limitation (LMB)).

## 17.2 Configuration – RCL 5100, Stand-Up Controls (HS)




1: RCL controller
2: Dump valve
3: Pressure transducer
4: Spool sensors
5: Power supply
6. External stop button
7. Proximity switch, HS
8. Proximity switch, slewing
9: Mercury switch

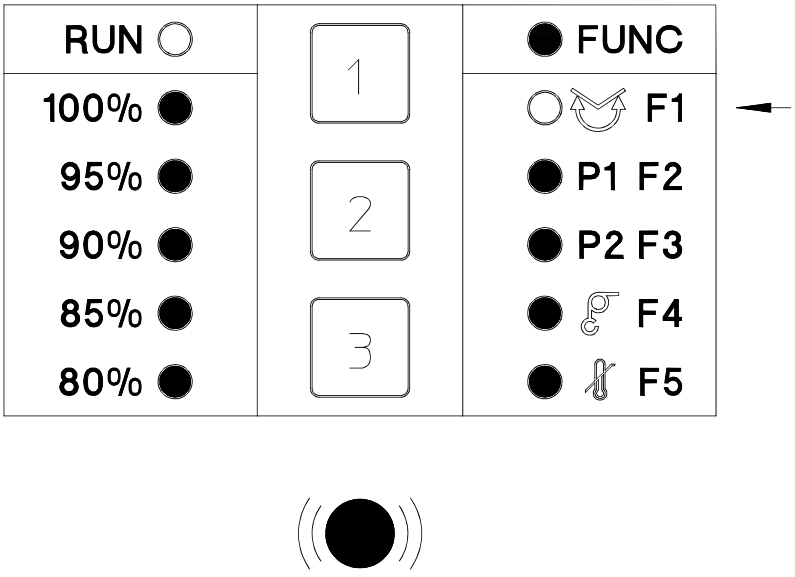
## 17.3 Configuration – RCL 5200, Stand-Up Controls (HS)



## 17.4 Slewing limitation, Stand-Up Controls

If the operator is standing on the stand-up platform and the slewing movement is to the right, the slewing movement will be stopped before the boom moves over the stand-up platform.
The slewing movement cannot be moved over the operator.
The controller indicates as follows:

- The diode with the slewing limitation symbol is constantly lit.
- The buzzer gives a constant signal.
- The dump valve opens to tank (the slewing movement is stopped).

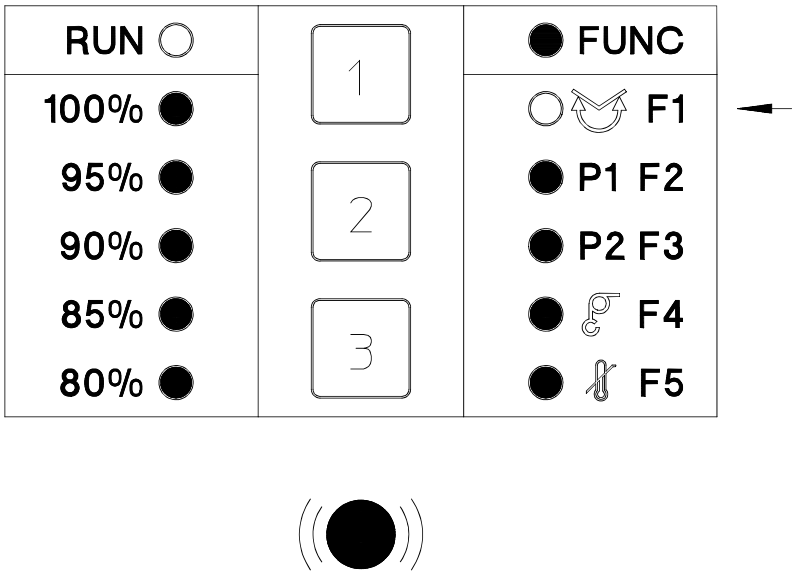


## 17.5 Warning during Slewing Movement over Stand-Up Controls

If the operator is standing on the stand-up platform and the slewing movement is to the right, the buzzer will give an interrupted signal before and while the boom moves over the stand-up platform.
The slewing movement is not being stopped.

If the operator tries to use the “boom down”-function in the area over the platform, the controller indicates as follows:

- The diode with the slewing limitation symbol is constantly lit.
- The buzzer gives a constant signal.
- The dump valve opens to tank (the boom down-movement is stopped).




This is to prevent that the operator accidentally lowers the boom over himself.

## 17.6 Combination of 2-Stage LMB and Safety System for Stand-Up Controls

Sensors and other equipment are the same as used in connection with **Safety System, Stand-Up Controls.**
Only in this case the controller has been programmed to control both safety systems.

## 18.3 RCL 5100 and the HDL-System

The HDL-system is semi-automatic, which means that the system is automatically activated at the normal lifting capacity limit of the loader, but by means of the red press button, the operator must manually disconnect the system again.

This disconnection implies that the load moment is below the loader's normal lifting capacity limit.

The buzzer gives a periodic signal as usual at 90% of the max. permissible load moment (90% of the HDL lifting capacity limit.

## 18.4 RCL 5200 and the HDL-System

The HDL-system is fully automatic, which means that the system is automatically activated when the load moment has been increased to the loader's normal lifting capacity limit, and it is automatically disconnected when the load moment is reduced below this limit.

However, the automatic disconnection implies that all control levers have been into neutral position at the same time as the load moment is below the loader's normal lifting capacity limit.

# 18. Heavy Duty Lifting, HDL 2

## 18.1 The HDL-System

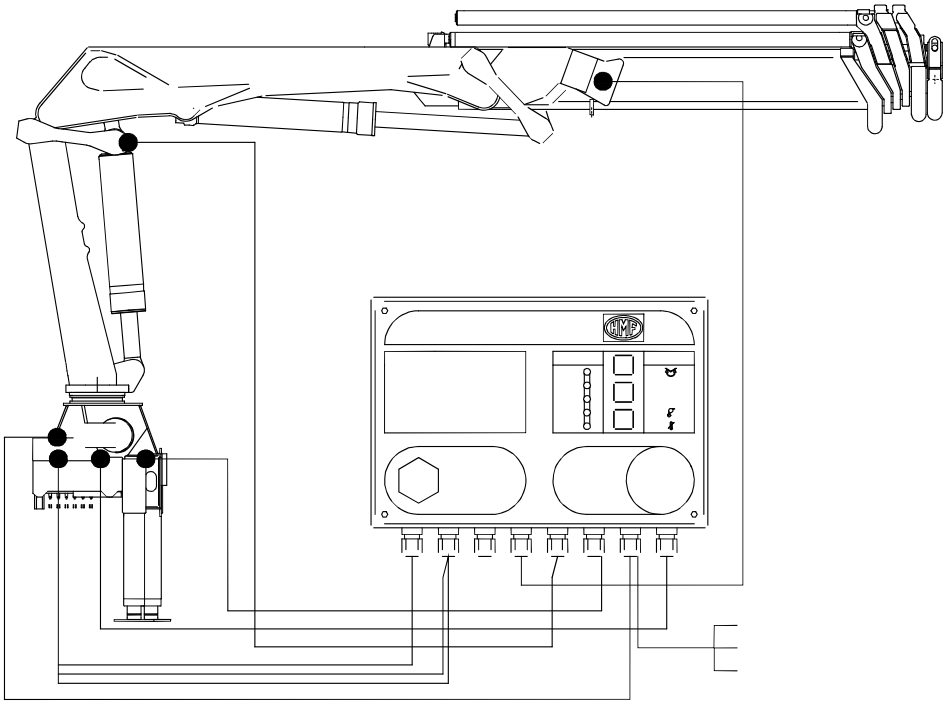
The HDL-system offers the possibility of increasing the nominal load when reducing the working speed at the same time.

When the loader reaches its normal lifting capacity limit, the HDL-system will automatically couple in, irrespective of the operator's doings, and the oil flow to the control valve will be reduced (by means of an HDL-valve being operated by the controller) to approx.  20% of the normal oil flow.

This is how the loader's lifting capacity is increased by approx. 10% in the entire working area of the loader.

When the HDL-system couples in, the operator will be able to continue extending the load without interruption, although at reduced speed.

## 18.2 Configuration – RCL, HDL 2



1: RCL controller (5100 / 5200)
2: Dump valve
3: HDL-valve
4: Pressure transducer
5: Spool sensors
6: Power supply
7: Mercury switch
8. External stop button

## 18.3 RCL 5100 and the HDL-System

The HDL-system is semi-automatic, which means that the system is automatically activated at the normal lifting capacity limit of the loader, but by means of the red press button, the operator must manually disconnect the system again.

This disconnection implies that the load moment is below the loader's normal lifting capacity limit.

The buzzer gives a periodic signal as usual at 90% of the max. permissible load moment (90% of the HDL lifting capacity limit.

## 18.4 RCL 5200 and the HDL-System

The HDL-system is fully automatic, which means that the system is automatically activated when the load moment has been increased to the loader's normal lifting capacity limit, and it is automatically disconnected when the load moment is reduced below this limit.

However, the automatic disconnection implies that all control levers have been into neutral position at the same time as the load moment is below the loader's normal lifting capacity limit.

## 18.5 Proportional HDL

In connection with the IRC-system, activation of the HDL-system is proportional, i.e. step-less.

Example:
A heavy load is extended at max. speed at a longer out-reach by means of the “extension out”-function.
When the loader has reached 70% of its capacity limit, the HDL is automatically activated independent of the operator’s doings.

Now the speed of the “extension out” movement is reduced proportionally down to 20% of the nominal working speed.

Correspondingly the working speed is increased proportionally to 100%, if the load is retracted to a shorter reach by means of the “extension in”- function.

The example describes how the HDL-system works in connection with the extension-function. The proportional HDL-activation functions in the same way in connection with all other loader functions, which increase or reduce the load moment of the loader.

When the HDL-system is activated, this is indicated on the RCL indicator panel by the FUNC diode flashing.

## 18.6 Micro Operation

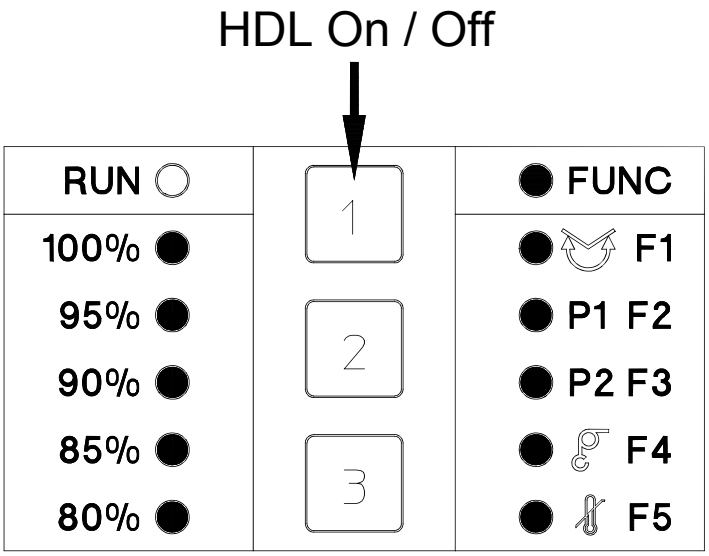
If, for instance the loader is to carry out positioning tasks, it will be possible to ***reduce the working speed of the loader*** by means of the HDL-system.

Irrespective of the loader's load moment, the working speed of the loader can be reduced to approx. 20% by pushing ***the red press button***.

When pushing the red press button, the buzzer confirms by a short signal.

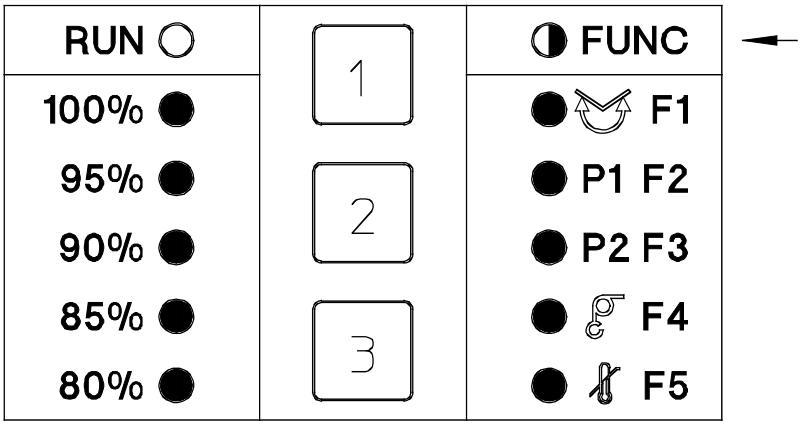
When ***normal speed*** is required ***again***, push the red press button again. Again the buzzer confirms by a short signal.

However, operating with normal speed again implies that all control levers have been into neutral position at the same time as the load moment is below the loader's normal lifting capacity limit.



## 18.7 HDL Indication

When the HDL-system is activated, this is indicated on the RCL indicator panel by the FUNC diode flashing.



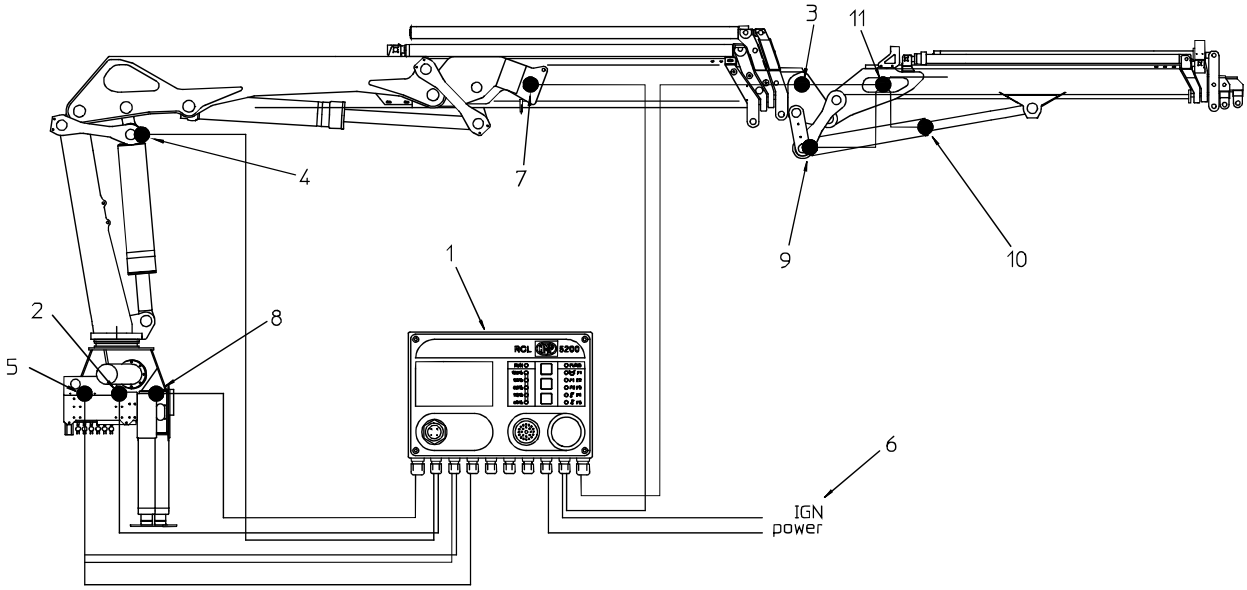
# 19. Safety System, Fly-Jib

## 19.1 The Safety System

On larger IMT loader models, a Fly-Jib can be fitted at the end of the jib extensions. The Fly-Jib makes loader operation flexible, but at the same time, it entails many situations where there is a risk of overloading either the loader or the Fly-Jib.

When connecting the sensors of the Fly-Jib to the RCL 5200 controller, the safety system is monitoring both the loader's and the Fly-Jib's conditions as regards load moment, operation and function.

## 19.2 Configuration, Fly-Jib



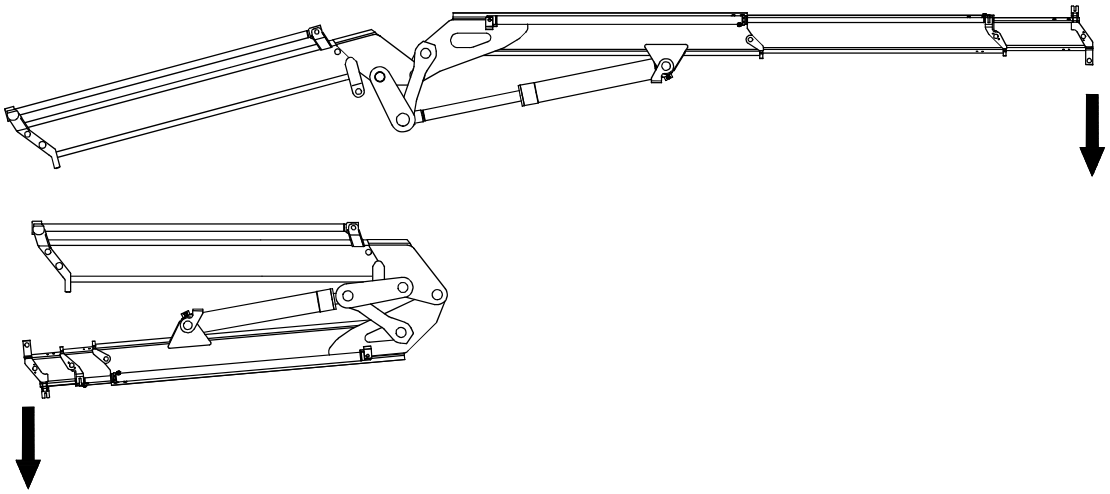

1: RCL 5200 controller
2: Dump valve
3: Dummy plug
4: Pressure transducer Loader (Boom)
5: Spool sensors
6: Power supply
7: Mercury switch, loader
8. External stop button
9. Pressure transducer, Fly-Jib (up)
10. Pressure transducer, Fly-Jib (down)
11. Mercury swithch, Fly-Jib

## 19.3 Mode of Operation of the Safety System

The basic principle of the RCL safety system is to secure both the loader and the Fly-Jib against overloading and the consequences of this. I.e. independent of the operator's doings, the system prevents that the max. permissible load moment of both the loader and the Fly-Jib is exceeded. (Load moment limitation – LMB).

The RCL 5200 controller monitors the two pressure transducers mounted on the boom cylinder. The pressure transducers register the hydraulic pressure, which is an indication of the load moment on the Fly-Jib.

The Fly-Jib can either have a positive load moment (at an angle moving away from the jib) or a negative load moment (at an angle moving under the jib).



The RCL 5200 registers according to the signal from one of the two pressure transducers, in which of the two positions the Fly-Jib has reached its max. load moment.

No matter which position the Fly-Jib has in relation to the jib, the controller will at any time give a signal to the hydraulic system of stopping the load moment increasing movements.

The control levers can be operated by activating load moment increasing Fly-Jib movements, but building up of a hydraulic pressure in the system is not possible (the dump valve opens so that the oil from the pump flows to tank).

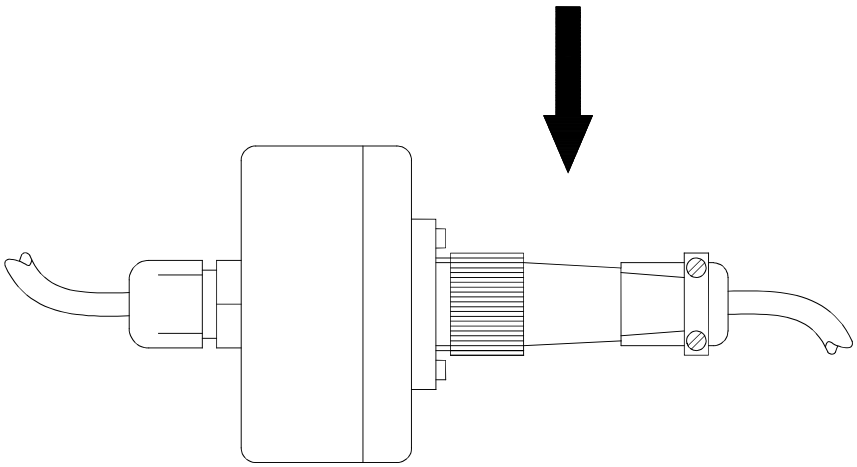
Load moment reducing Fly-Jib functions as well as the slewing movement can be operated freely (the dump valve closes so that the oil from the pump can flow to the Fly-Jib cylinders).

## 19.4 Loader Operation with and without Fly-Jib

The Fly-Jib can be removed and fitted to the loader as required. Therefore, a plug is fitted at the end of the jib extensions, so that it will be possible to separate the electric connection to the sensors.

## 19.5 Loader Operation with Fly-Jib

When the Fly-Jib is mounted on the loader, the electric plug must always be fitted. When the plug is fitted, this is also a signal to the RCL 5200 controller for activating the safety system so that it also includes the Fly-Jib.



## 19.6 Loader Operation without Fly-Jib

When working with the loader without Fly-Jib, there must be fitted a *dummy plug* instead of the electric plug from the Fly-Jib.

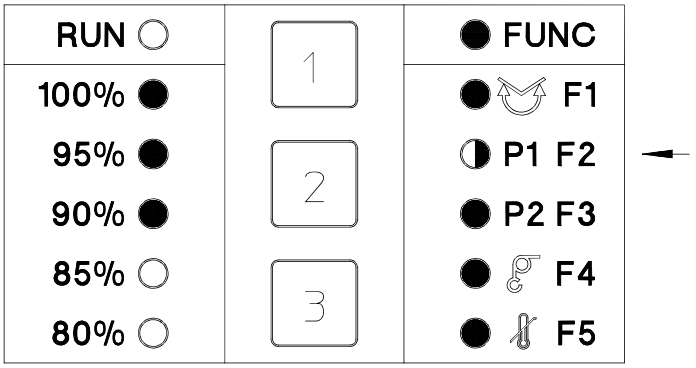
When the *dummy plug* is fitted this is also a signal to the RCL 5200 controller of the Fly-Jib not being fitted and that the safety system must be activated so that it only includes the loader.

## 19.7 Signalling during Loader Operation with Fly-Jib

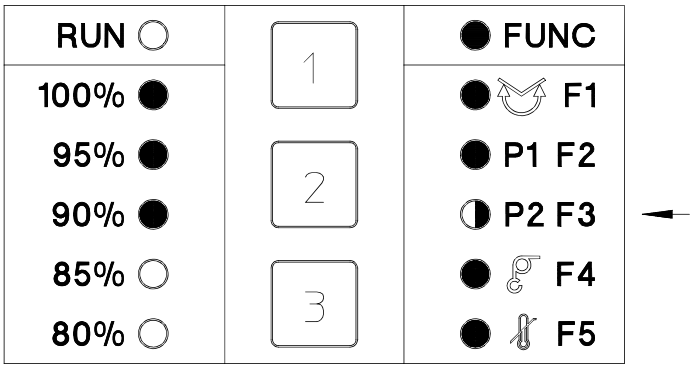
When the Fly-Jib is mounted on the loader, the diodes of the controller indicate whether it is the loader or the Fly-Jib that has the largest load moment:

- At for instance a load moment of 80% (when the 80% diode is constantly lit), also the P1 or the P2 diode starts to flash.
- When the diode P1 flashes, it means that it is the loader that has a load moment of 80%.
- When the diode P2 flashes, it means that it is the Fly-Jib that has a load moment of 80%.
- The diodes 80% through 100% are constantly related to either the P1 or the P2 diode (the load moment of the loader or the Fly Jib).

The loader has the largest load moment (85%)



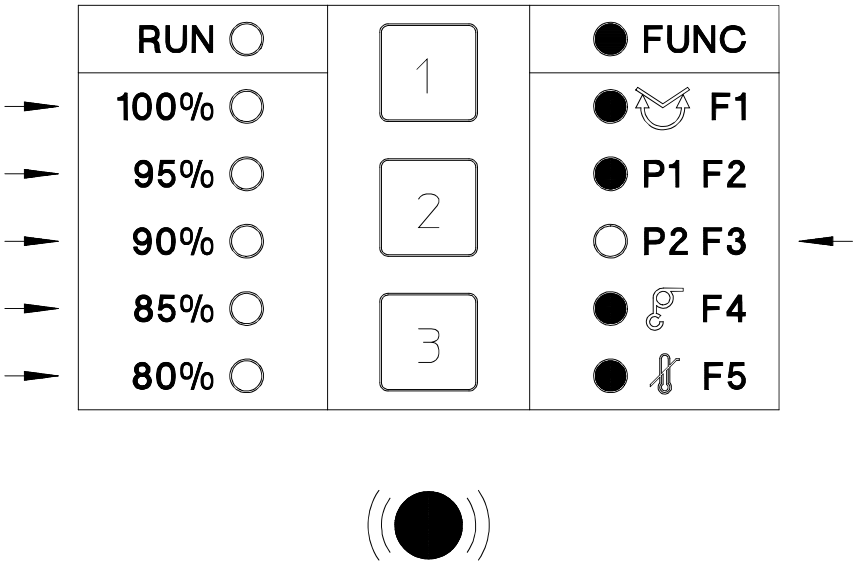

The Fly-Jib has the largest load moment (85%).




Only one of the diodes, P1 or P2 is flashing at a time. It will thus be possible during loader operation to follow whether the loader or the Fly Jib has the largest load moment.
This offers the possibility of using the loader/the Fly Jib to its maximum.

## 19.8 When the max. load moment of the Fly-Jib is 100%, the controller indicates as follows:

- All diodes 80 through 100% are constantly lit.
- The diode P2 is constantly lit.
- The buzzer gives a constant signal.
- The dump valve opens to tank and the Fly-Jib movement causing the overload is stopped.




Please note!
The Fly-Jib is overloaded but it is still possible to increase the load moment of the loader.

## 19.9 Warning when Working with Loader and Fly-Jib

- The loader safety system prevents the loader and Fly-Jib from being overloaded, but being the operator you are still responsible for safe operation of the loader/Fly-Jib.

- The Fly-Jib increases the loader's out-reach considerably. Therefore generally operate the loader carefully.

- Lower a load carefully, when working at big heights with loader and Fly-Jib. The load moment is increased suddenly and very fast, and can easily lead to serious overloading/unstability.

- Always carry out a slewing movement carefully. Especially when moving a heavy load at a long reach.

- When the Fly-Jib is mounted on the loader, also *the electric plug* must be fitted. Working with loader and Fly-Jib is not permitted while the *dummy plug* is fitted. In this case the safety system for the Fly-Jib is not activated.

- When the Fly-Jib is removed, the *dummy plug* must be fitted. Otherwise the RCL 5200 controller indicates an error (the RUN diode flashes and the buzzer gives a constant signal), and the loader cannot be operated.

- Remember to press the stop button on the RCL 5200 controller before removing *the electric plug.* Otherwise the controller indicates an error, which is registered in the black box of the controller.

# 20. Safety System, Winch

## 20.1 The Safety System

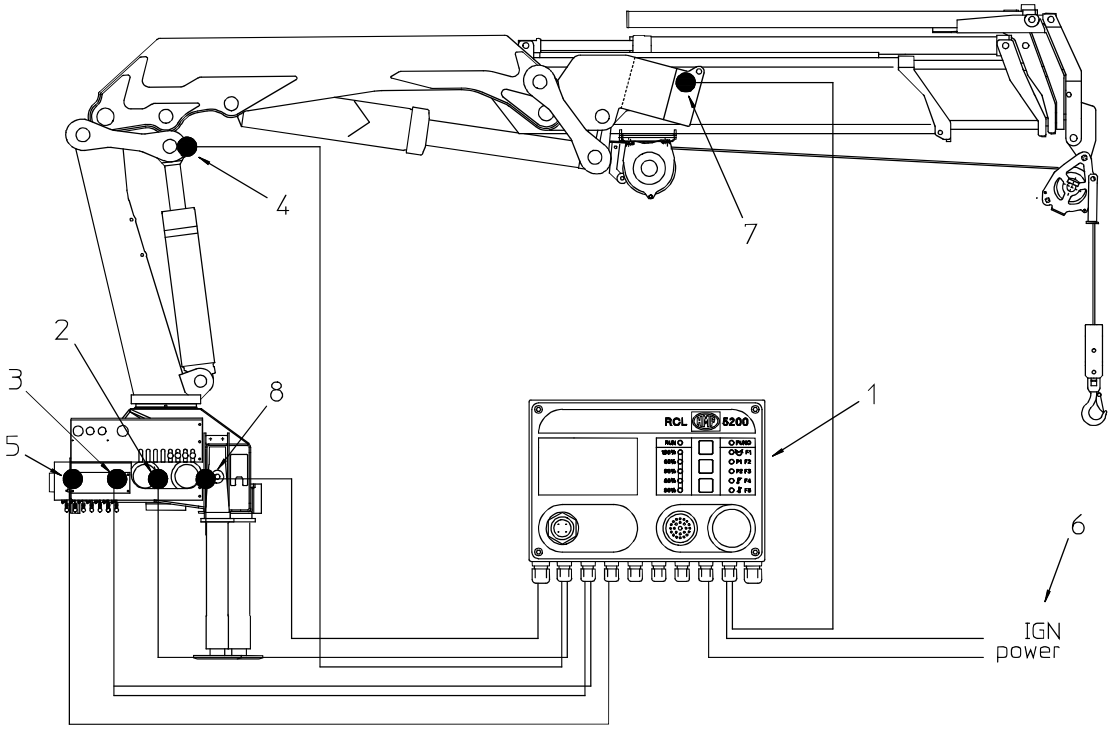
On several IMT loader models it is possible to fit a hoisting winch. The winch is mounted on the jib, and the wire runs through a wire pulley placed in the hook suspension of the loader. At the end of the wire is fitted a swivel hook.

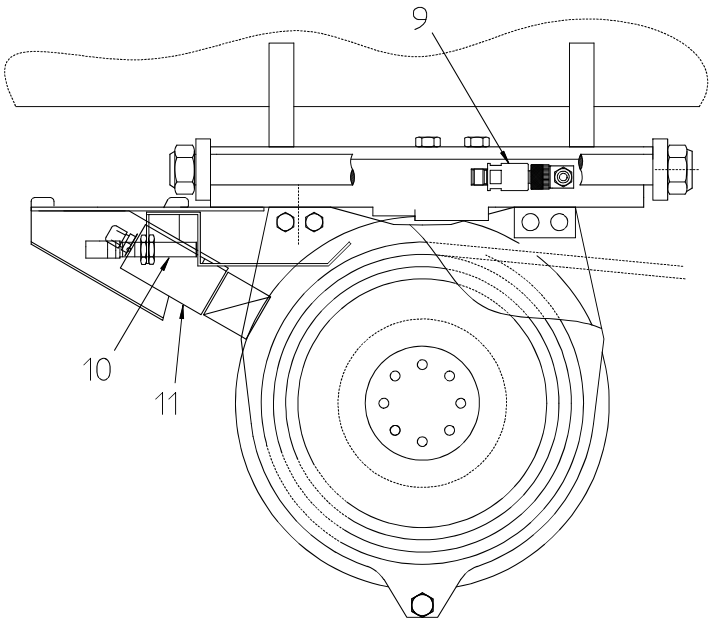
A winch can also be used on loaders fitted with Fly-Jib.

When working with loader and winch, many situations might occur, where there is a risk of overloading the loader and the winch system.

When connecting the sensors of the winch to the RCL 5200 controller, the safety system is monitoring the loader's, the Fly-Jib's, as well as the winch's conditions as regards load moment, operation and function.

## 20.2 Configuration, Winch




1: RCL 5200 controller
2: Dump valve
3: Power box
4: Pressure transducer (boom)
5: Spool sensors
6: Power supply
7: Mercury switch
8. External stop button
9. Pressure transducer (winch)
10. Proximity switch, (Winch up)
11. Proximity switch, (Winch down)

## 20.3 Mode of Operation of the Safety System

The basic principle of the RCL safety system is to secure both the loader and the winch system against overloading and the consequences of this. I.e. independent of the operators doings, the safety system protects against overloading of the loader, the Fly-Jib, the winch, and the wire.

Apart from the load on the loader and the Fly-Jib, the RCL 5200 controller is monitoring the following sensors on the winch:

- A pressure transducer registering the wire pull and thereby the load on the winch. In case of overloading, all loader and winch movements increasing the wire pull are stopped.

- A proximity switch registering how many winds of cable that are left on the cable drum. When there are 3 winds of cable left on the drum, the ease movement is stopped.

- A proximity switch registering whether the wire is wound correctly on the cable drum. In case of the wire overfilling the cable drum, the hoist movement is stopped.

The control levers can be operated even though the above mentioned movements are stopped, but building up of a hydraulic pressure in the system is not possible (the dump valve opens so that the oil from the pump flows to tank).

Load moment reducing movements, as well as movements in the opposite direction in relation to the movements leading to the loader stop, can be operated freely (the dump valve closes).

## 20.4 The Functions of the Safety System

The safety system for winch protects the loader, winch, and wire against overloading in the following situations:

- In case of trying to lift a load exceeding the max. permissible wire pull, the wire is protected in the following way:
    - If there are several winds of cable on the cable drum (i.e. 4 layers), a relief valve will relieve the hydraulic pressure corresponding to this max. permissible wire pull. Therefore the winch cannot lift the load.
    - If there are few winds of cable on the cable drum (i.e. 1 layer), the pressure transducer gives signal to the controller of the *winch up* movement should be stopped.

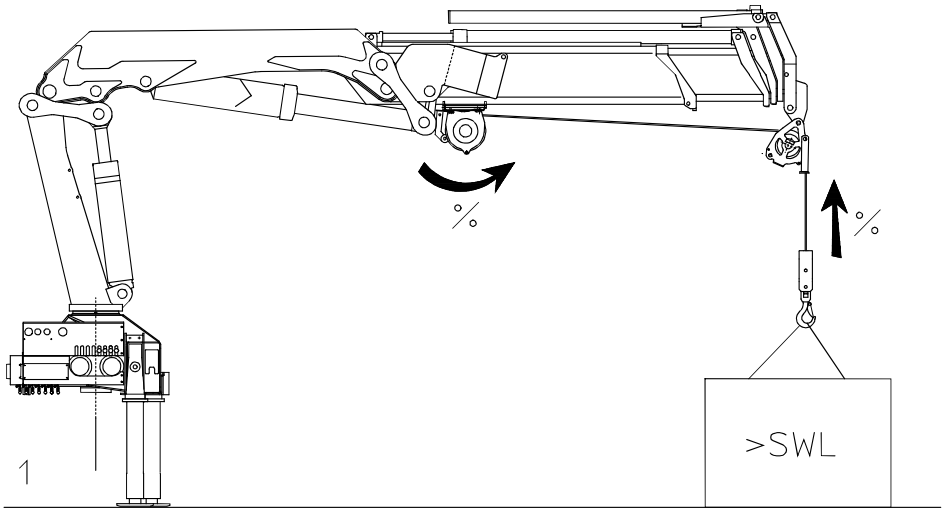



Fig 1

- If the hook is hoisted up to the bracket of the hoist stop, so that the max. permissible wire pull is exceeded, the wire is protected in the following way:

    - If there are several winds of cable on the cable drum (i.e. 4 layers), a relief valve will relieve the hydraulic pressure corresponding to this max. permissible wire pull. Therefore the winch cannot lift the load.

    - If there are few winds of cable on the cable drum (i.e. 1 layer), the pressure transducer gives signal to the controller of the *winch up* movement should be stopped.

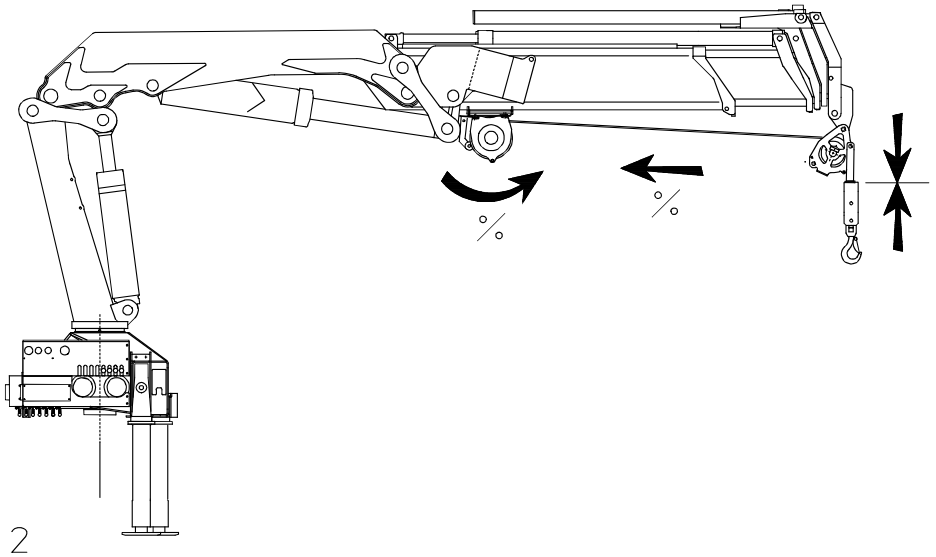


Fig 2

- If the hook is hoisted to the bracket of the hoist stop, and the *extension out* function is operated by mistake, the wire pull is increased, and at the max. permissible wire pull, the pressure transducer gives signal to the controller of the *extension out* function should be stopped.

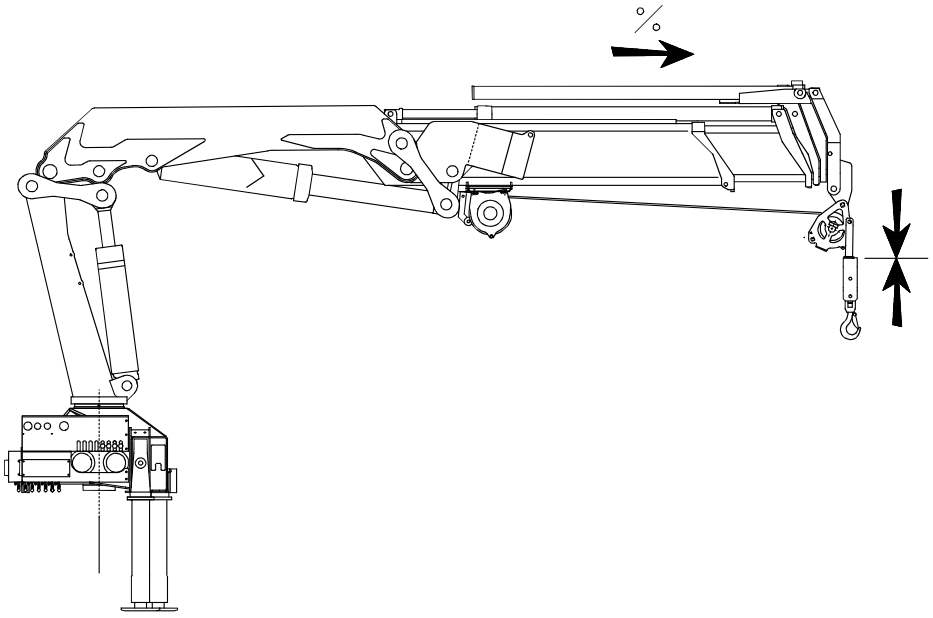


Fig 3

- In case of trying to lift a load that is heavier than the max. permissible wire pull at a short range by means of the *boom up* or the *jib up* function, the wire can easily be overloaded. In this case, the pressure transducer gives signal to the controller of the *boom up* and *jib up* movements to stop.

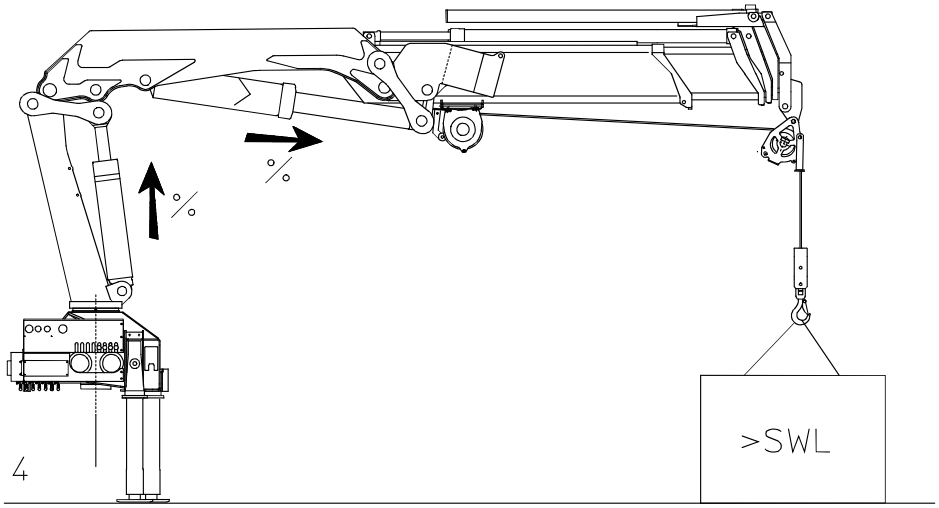



Fig 4

- If the loader is fitted with a Fly-Jib and the hook is hoisted up to the bracket of the hoist stop, and the *Fly-Jib up* function is operated by mistake, this movement can entail that the load on the wire exceeds the max. permissible limit. In this case, the pressure transducer gives signal to the controller of the *Fly-Jib up* movement to stop.

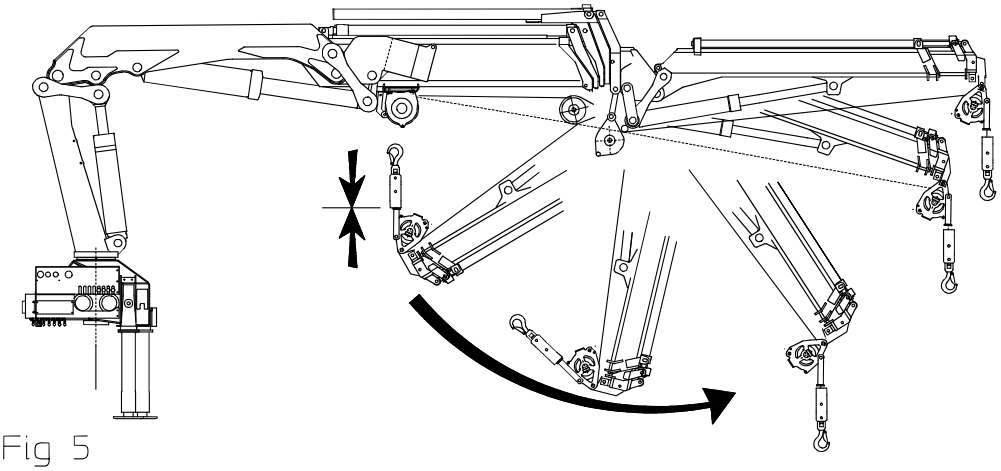


Fig 5

- If the loader is fitted with a Fly-Jib, and a load that exceeds the max. permissible limit is lifted by means of the *boom*, *jib, Fly-Jib* or *winch* functions, these movements can entail that the load on the wire exceeds the max. permissible limit. In this case, the pressure transducer gives signal to the controller of the *boom up, jib up, Fly-Jib up* and *winch up* movements to stop.

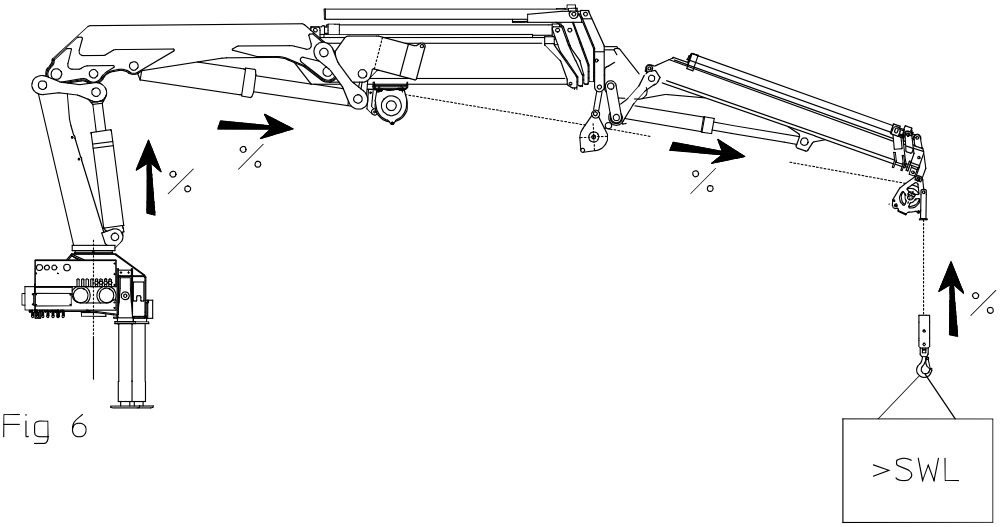



Fig 6

- **Please note!**
  If the loader is fitted with a Fly-Jib while working with a winch, the max. permissible load moment on the winch is reduced to:
  600 kg for Fly-Jib 5 and 900 kg for Fly-Jib 900.

  If the Fly-Jib is removed, and the winch is operated, the max. permissible load moment on the winch is increased to the normal level.

- **Please note!**
  When working with winch, and there is a load exceeding 600 kg hanging in the wire, it is not possible to operate the *extension out* function neither on the loader nor the Fly-Jib

  Only if working with the *winch down* function at the same time, it will be possible to move a load exceeding 600 kg with the *extension out* function.

- When the wire is eased from the cable drum and there are approx. 3 winds of cable left on the cable drum, the largest proximity switch gives signal to the controller of the *winch ease* movement to be stopped.

  The inductive sensor has two diodes with the following indications:

  - During loader operation, the green diode – POWER - is lit (otherwise it is turned off).
  - When there are more than 3 winds of cable left on the cable drum, the yellow diode LOAD ON is lit.
  - When there are only 3 winds of cable left on the cable drum, and the *winch down* movement has been stopped, the yellow diode LOAD ON is no longer lit.

- In case of too much wire on the cable drum (i.e. overfilling or lopsided winding of the wire) the smallest proximity switch gives signal to the controller of the *winch up* movement to be stopped.

  The inductive sensor has a diode, which during loader operation, indicates as follows:

  - When the winch is working correctly and the cable drum is not overfilled, the yellow diode is lit.
  - In case of too much wire on the cable drum, and the *winch up* movement has been stopped, the yellow diode is no longer lit.

## 20.5 Signalling during Loader Operation with Winch

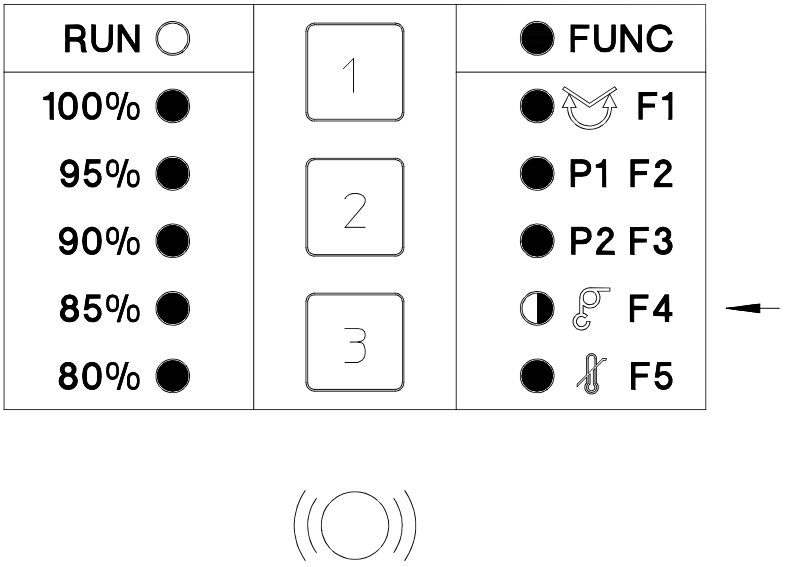
During loader operation with winch, the RCL 5200 controller's diodes indicate if the loader, the Fly-Jib, the winch or the wire is overloaded.

When the safety system interferes due to one of the following situations

- The wire pull is to big
- There are only 3 winds of cable left on the cable drum
- There is too much wire on the cable drum

the controller indicates as follows:

- The diode with the winch symbol flashes.

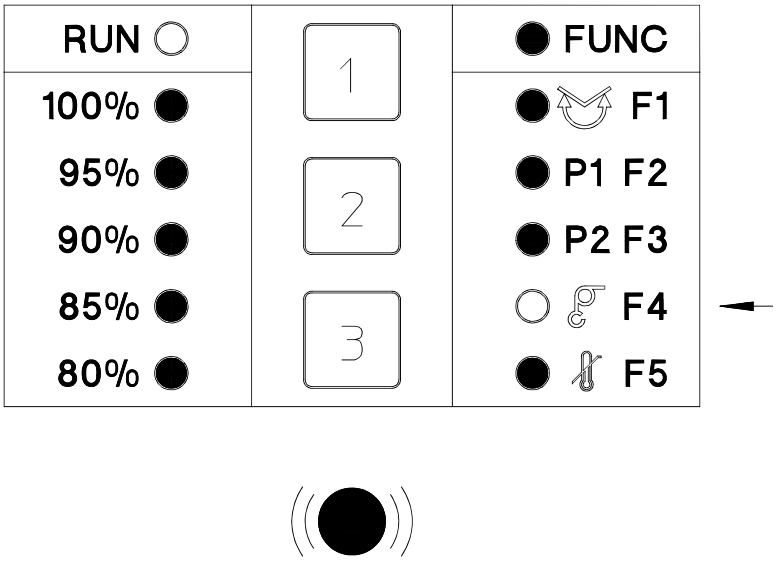


If the control levers, in relation to the above mentioned situations, are operated in a direction where the function

- increases the wire pull
- operates the winch down movement
- operates the winch up movement

the controller indicates as follows:

- The diode with the winch symbol is constantly lit
- The buzzer gives a constant signal
- The dump valve opens, and the above mentioned movements cannot be operated.



## 20.6 Warning when Working with Loader and Winch

- The loader safety system prevents the loader and winch system from being overloaded, but being the operator you are still responsible for safe operation of the loader/winch.

- Do not try to lift a load that weighs more than indicated on the SWL label on the swivel hook. The value indicates the max. permissible stress on the wire.

- Always operate the winch in a considerate way, and make sure that the wire has a correct winding and not for instance lopsided winding.

- Never make diagonal movements with the winch. Only make vertical lifts with a winch.

- Never drag a load across a surface. The winch is only meant for lifting vertically.

- Constantly keep the wire tight when working with a winch. Stop the *winch down* movement as soon as the load is placed on the surface.

- Always operate the *winch up* movement carefully when the hook reaches the hoist stop.

- Avoid fast movements with the winch when working at a long reach.

- Avoid oscillation of the load when it is hanging in a long wire.

- Operate the winch carefully up and down, when working at big heights with loader and Fly-Jib, if any.

- Extend the jib extensions to the position where the load is to be handled by means of the winch. Avoid extending the extensions on the loader and the Fly-Jib when a load is hanging in the wire.

- Always respect when the safety system stops the loader/winch function and check what was the reason for the loader stop.

## 21. Activation of Optional Extras

The RCL-system can be extended, offering the possibility of activating optional extras on the loader from the controller.

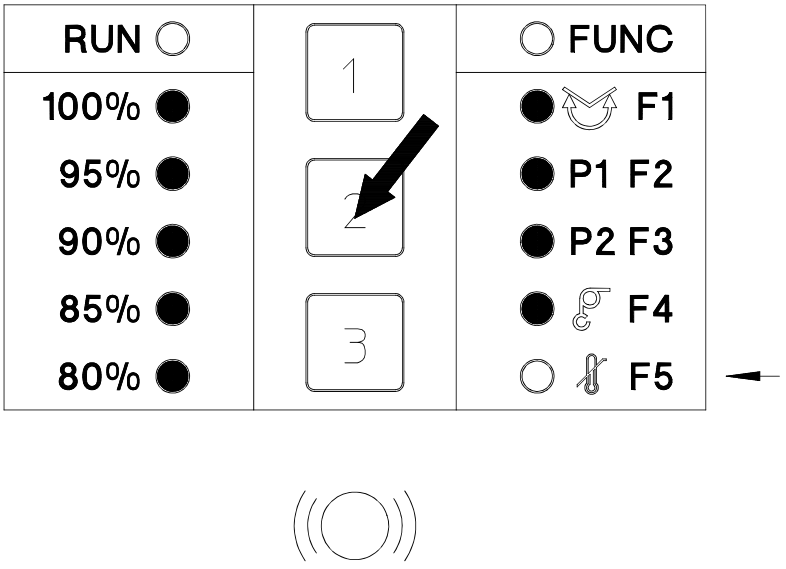
This equipment can be activated as follows:

- Push the yellow press button a number of times (dependent on the equipment)
- The yellow FUNC diode and one of the diodes (F1 through F5) are constantly lit in 10 seconds.

The right column of diodes now indicates alternative functions F1 through F5. Up to 5 different kinds of optional extras can be connected and the diodes F1 through F5 now indicate which optional extra is connected at the moment.

A further description of alternative functions is available in this manual.

Example:



# 22. Electric Activation, Loader Functions / Stabilizers

IMT-loaders can be equipped with an electric change-over valve connected to the RCL-controller.

The change-over valve is activated by means of a press button on the controller. The change-over valve leads the oil flow either to the loader valve block or the stabilizer valve block.

**Please note!**
Every time the controller is started up, the change-over valve is automatically in a position where the valve block for the loader functions is ready for operation.

## 22.1 Operation of the Stabilizer Functions

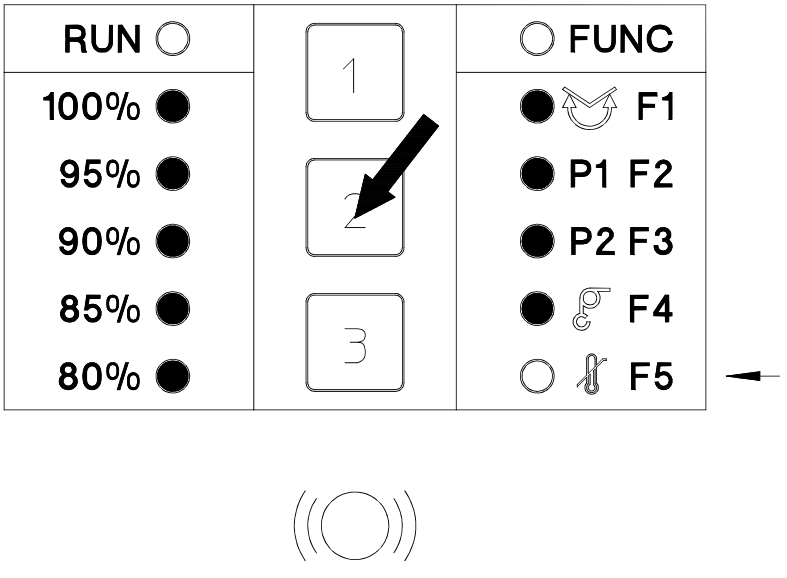
Before loader operation, extend the stabilizer beams and lower the stabilizer legs to the surface.

To be able to operate the stabilizer functions, carry out the following:

- Connect the pump (PTO); the controller is thus powered.
- All stop buttons must be pulled out (there is a stop button at each control position).

- Push the green press button on the RCL indicator panel
- The RUN diode is now constantly lit and the RCL-safety system is activated.
- Push the yellow press button *twice* to choose the stabilizer function and the following is indicated:

    - The yellow FUNC diode and the red diode F5 are constantly lit in 2 seconds.
    - Both diodes are turned off again after 2 seconds, but the stabilizer function is still activated.




Now the stabilizer legs can be lowered to the ground.

## 22.2 Operation of the Loader Functions

When the stabilizer beams have been extended and the stabilizer legs lowered, and the vehicle thus supported, the following must be carried out before operating loader functions:

- Either: activate one of the loader's control levers (a function with spool sensor)
- or: push the yellow press button *twice.*
- It will now be possible to operate the loader functions.

## 22.3 Emergency Operation of the Stabilizer Functions

If the power supply for the change-over valve fails, it is not activated, and the stabilizer functions cannot be operated.

In this situation it is possible to turn a thumbscrew on the change-over valve outwards. The change-over valve is thus activated manually, and the stabilizers can then be operated.

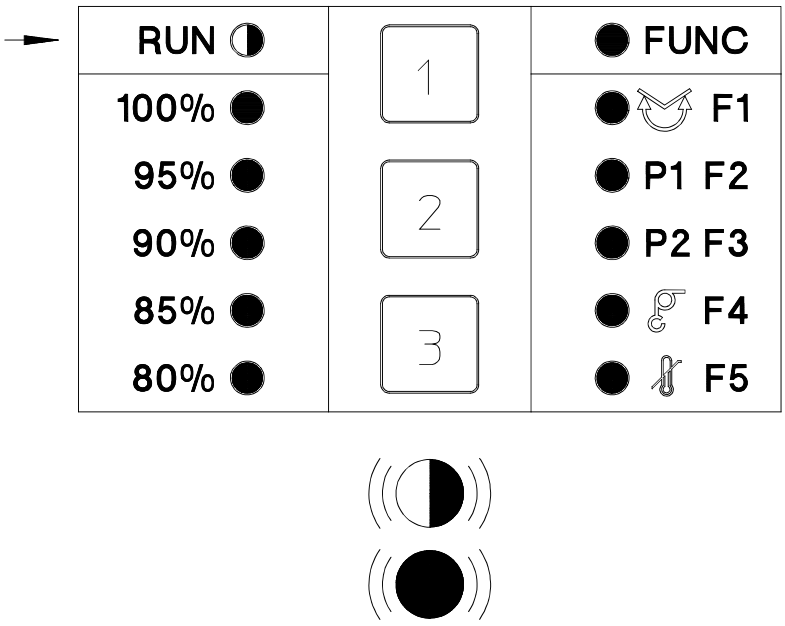
Turn the thumbscrew inwards again, when operating the loader functions again.

# 23. Indication of Errors / Emergency Operation of the Loader

## 23.1 Indication of Errors

If, during loader operation, a system error occurs internally in the controller or externally in plugs, cables, sensors, etc., the controller indicates as follows:

- The RUN diode starts to flash
- The buzzer gives a periodic signal.
- ***In case of dangerous system errors*** the buzzer gives a constant signal and the dump valve opens to tank (all loader movements are stopped).



System errors are graduated into 3 levels as regards danger, i.e. which intervention the safety system should make:

***0. Relatively undangerous system errors*** demanding a warning (indication)

***1. Less dangerous system errors*** demanding warning/derating (indication/reduction of lifting capacity)

***2. Dangerous system errors*** demanding stop of the loader (the dump valve opens)

When pushing the red press button, the diodes will flash in a combination indicating where to find the error in the system.

The left column of diodes indicates the category of error type, and the right column of diodes specifies where to find the error on the loader.

In the chapter – Troubleshooting – is stated where the error can be found in relation to the indications of the diodes.

## 23.2 Emergency Operation of the Loader

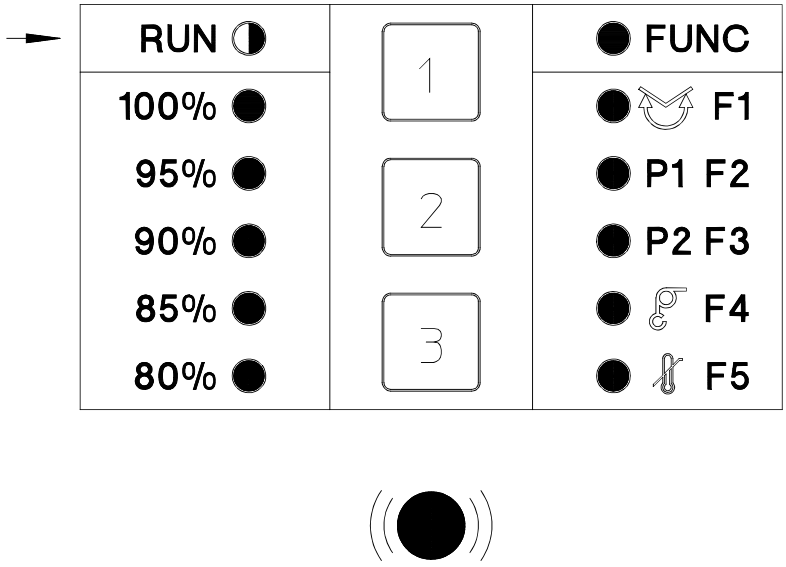
In connection with a dangerous system error:

- The RUN diode flashes
- The buzzer gives a constant signal
- The dump valve opens to tank.

emergency operation of the loader can take place at the same time as the red press button is kept down.

Please note that at the same time, the diodes will flash in a combination indicating where to find the error in the system.

**Please note!**
No matter which level of system error (category of error), the error **must** be found and remedied. Please see chapter on Troubleshooting.



# 24. Troubleshooting

## 24.1 How to troubleshoot

If the controller indicates a system error – the RUN diode flashes and the buzzer gives a periodic/constant signal (please see chapter on Indication of Errors) – the operator must search for errors in the following way:

Push the red press button (**Please note:** before pushing the red press button, make sure that the control levers are in neutral position (not activated)), and keep it down, the following is indicated:

- The RUN diode flashes
- The buzzer gives a periodic signal (or constant signal dependent on the type or error)
- Some of the red diodes are flashing in a combination indicating the type of error.

## 24.2 Explanation to the Troubleshooting Sheets

When comparing the flashing combination of diodes with the following sheets, it will be possible to determine the **type of error, the cause of the error** as well as **how to remedy the error.**

In the field **intervention from the safety system** a code number is stated:

**0. Indication:**
It is a relatively harmless system error and the present loader operation can be finished.

**1. Reduction of the lifting capacity to 90%**
It is a less dangerous system error and the present loader operation can be finished; however the lifting capacity will be reduced.

**2. Stop of the Loader**
It is a dangerous system error stopping the loader movements. It will be possible to make an emergency operation (please see chapter on Emergency Operation of the Loader), i.e. fold the loader and remedy the error.

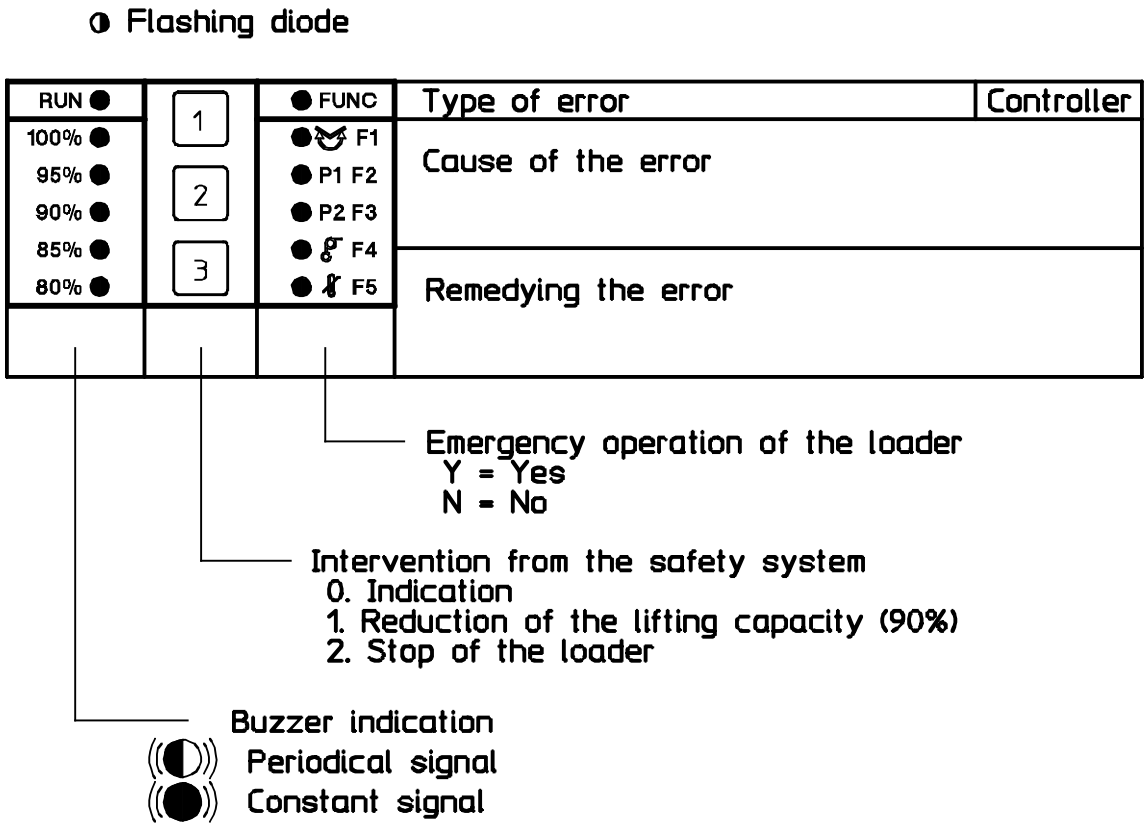
**Please note!** No matter which category of error, the error **must** be found and remedied.

In the field **emergency operation of the loader** a code letter is stated:

Y: means that *emergency operation* can be made (dangerous system error)

N: means that *emergency operation is not possible* (relatively harmless/less dangerous system error). The present loader operation can be finished.

In the field **controller** is stated which type of controller the indication of error concerns. Given that the *RCL 5100* has fewer facilities than the *RCL 5200*, there are consequently fewer types of indications.



| RUN ◑ | 1 | ● FUNC | Critically high oil temperature | 5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | | |
| 95% ● | 2 | ● P1 F2 | The error may be due to a defect in connection with the oil cooler. | |
| 90% ◑ | | ● P2 F3 | | |
| 85% ● | 3 | ● F4 | | |
| 80% ◑ | | ◑ F5 | The system is ready again, when the oil temperature is below the max. permissible limit. Otherwise contact an HMF Service Point. | |
| ((◐)) | 2 | Y | | |

| RUN ◑ | 1 | ● FUNC | Out-let error, dump valve. | 5100/5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | | |
| 95% ● | 2 | ● P1 F2 | The error may be due to a defect dump valve, cable breakdown, short circuit or perhaps superheating of the dump valve outlet | |
| 90% ◑ | | ◑ P2 F3 | | |
| 85% ● | 3 | ◑ F4 | | |
| 80% ● | | ● F5 | Check kables, socket-outlet and plug ect. for the dump valve. Otherwise contact an HMF Service Point. Emergency operation of the loader will not be possible if the error is in the dump valve. | |
| ((◐)) | 2 | N(Y) | | |

| RUN ◑ | 1 | ● FUNC | Outlet error, HDL valve | 5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | | |
| 95% ● | 2 | ● P1 F2 | The error may be due to a defect HDL valve, cable breakdown, short circuit or perhaps superheating of the HDL outlet. | |
| 90% ◑ | | ◑ P2 F3 | | |
| 85% ● | 3 | ● F4 | | |
| 80% ● | | ◑ F5 | Check cables, socket outlet and plug etc. for the HDL valve. Otherwise contact an HMF Service Point. | |
| ((◐)) | 1 | N | | |

| RUN ◑ | 1 | ● FUNC | Outlet error, oil cooler | 5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | | |
| 95% ● | 2 | ● P1 F2 | The error may be due to a defect oil cooler, cable breakdown, short circuit or perhaps superheating of the oil cooler outlet. | |
| 90% ◑ | | ◑ P2 F3 | | |
| 85% ● | 3 | ● F4 | | |
| 80% ● | | ● F5 | Check cables, socket outlet and plug etc. for the oil cooler. Otherwise contact an HMF Service Point. | |
| ((◐)) | 0 | N | | |

| RUN | | FUNC | Error in pressure transducer boom | 5100/5200 |
|---|---|---|---|---|
| 100% | 1 | F1 | The error may be due to a defect pressure transducer, cable breakdown or perhaps short circuit. | |
| 95% | | P1 F2 | | |
| 90% | 2 | P2 F3 | | |
| 85% | | F4 | Check cables, socket outlet and plug etc. for the pressure transducer. Otherwise contact an HMF Service Point. | |
| 80% | 3 | F5 | | |
| | 2 | Y | | |

| RUN | | FUNC | Error in spool sensor slew | 5100/5200 |
|---|---|---|---|---|
| 100% | 1 | F1 | The error may be due to a defect spool sensor, cable breakdown or short circuit. | |
| 95% | | P1 F2 | | |
| 90% | 2 | P2 F3 | | |
| 85% | | F4 | Check cables socket outlet and plug etc. for the spool sensor on the control valve section for the slewing movement. Otherwise contact an HMF Service Point. | |
| 80% | 3 | F5 | | |
| | 2 | Y | | |

| RUN | | FUNC | Error in spool sensor, boom. | 5100/5200 |
|---|---|---|---|---|
| 100% | 1 | F1 | The error may be due to a defect spool sensor, cable breakdown or short circuit. | |
| 95% | | P1 F2 | | |
| 90% | 2 | P2 F3 | | |
| 85% | | F4 | Check cables, socket-outlet and plug etc. for the spool sensor on the control valve section for the boom function. Otherwise contact an HMF Service Point. | |
| 80% | 3 | F5 | | |
| | 1 | N | | |

| RUN | | FUNC | Error in spool sensor, jib. | 5200 |
|---|---|---|---|---|
| 100% | 1 | F1 | The error may be due to a defect spool sensor, cable breakdown or short circuit. | |
| 95% | | P1 F2 | | |
| 90% | 2 | P2 F3 | | |
| 85% | | F4 | Check cables, socket-outlet and plug etc. for the spool sensor on the control valve section for the jib function. Otherwise contact an HMF Service Point. | |
| 80% | 3 | F5 | | |
| | 1 | N | | |

| RUN ◑ | 1 | FUNC | Error in spool sensor, extension. | 5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | The error may be due to a defect spool sensor, cable breakdown or short circuit. | |
| 95% ● | 2 | ● P1 F2 | | |
| 90% ● | | ◑ P2 F3 | | |
| 85% ◑ | 3 | ● F4 | Check cables, socket-outlet and plug etc. for the spool sensor on the control valve section for the extension function. Otherwise contact an HMF Service Point. | |
| 80% ● | | ● F5 | | |
|  | 1 | N | | |

| RUN ◑ | 1 | FUNC | Error in spool sensor, Fly Jib | 5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | The error may be due to a defect spool sensor, cable breakdown or short circuit. | |
| 95% ● | 2 | ● P1 F2 | | |
| 90% ● | | ● P2 F3 | | |
| 85% ◑ | 3 | ◑ F4 | Check cables, socket-outlet and plug etc. for the spool sensor on the control valve section for the jib function of the Fly Jib. Otherwise contact an HMF Service Point. | |
| 80% ● | | ◑ F5 | | |
|  | 1 | N | | |

| RUN ◑ | 1 | FUNC | Error in spool sensor, Fly Jib ext. | 5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | The error may be due to a defect. Spool sensor, cable breakdown or short curcuit. | |
| 95% ● | 2 | ● P1 F2 | | |
| 90% ● | | ● P2 F3 | | |
| 85% ◑ | 3 | ◑ F4 | Check cables, socket outlet and plug etc. for the spool sensor on the control valve section for the extension function of the Fly Jib . Otherwise contact an HMF Service Point. | |
| 80% ● | | ● F5 | | |
|  | 1 | N | | |

| RUN ◑ | 1 | FUNC | Error in spool sensor, Winch | 5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | The error may be due to a defect spool sensor, cable breakdown or short curcuit. | |
| 95% ● | 2 | ● P1 F2 | | |
| 90% ● | | ● P2 F3 | | |
| 85% ◑ | 3 | ● F4 | Check cables, socket outlet and plug etc. for the spool sensor on the control valve section for the Winch function. Otherwise contact an HMF Service Point. | |
| 80% ● | | ◑ F5 | | |
|  | 1 | N | | |

| RUN ◑ | 1 | ● FUNC | Error, press. transd. Fly-Jib (Primary) | 5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | The error may be due to a defect pressure transducer, cable breakdown or short circuit. | |
| 95% ● | 2 | ● P1 F2 | | |
| 90% ● | | ● P2 F3 | | |
| 85% ◑ | 3 | ◑ F4 | Check cables, socket-outlet and plug etc. for the pressure transducer. Otherwise contact an HMF Service Point. | |
| 80% ◑ | | ◑ F5 | | |
| ((◐)) | 2 | Y | | |

| RUN ◑ | 1 | ● FUNC | Error, press. transd. Fly-Jib (Second.) | 5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | The error may be due to a defect pressure transducer, cable breakdown or short circuit. | |
| 95% ● | 2 | ● P1 F2 | | |
| 90% ● | | ● P2 F3 | | |
| 85% ◑ | 3 | ◑ F4 | Check cables, socket-outlet and plug etc. for the pressure transducer. Otherwise contact an HMF Service Point. | |
| 80% ◑ | | ● F5 | | |
| ((◐)) | 0 | N | | |

| RUN ◑ | 1 | ● FUNC | Error, pressure transducer Winch | 5200 |
|---|---|---|---|---|
| 100% ● | | ● F1 | The error may be due to a defect pressure transducer, cable breakdown or short circuit. | |
| 95% ● | 2 | ● P1 F2 | | |
| 90% ● | | ● P2 F3 | | |
| 85% ◑ | 3 | ● F4 | Check cables, socket-outlet and plug etc. for the pressure transducer. Otherwise contact an HMF Service Point. | |
| 80% ◑ | | ◑ F5 | | |
| ((◐)) | 2 | Y | | |

There are more types of errors than indicated in the above tables.

If such a type of indication should occur, please contact an IMT service point.

# 25. Technical Data RCL

| DATA | RCL 5100 | RCL 5200 |
|---|---|---|
| Micro processor | 80C592 | 80C592 |
| Clock frequency | 16Mhz | 16Mhz |
| Flash EPROM | 128Kbytes | 128Kbytes |
| Non volatile RAM | 32 Kbytes | 32 Kbytes |
| Digital input | 8 | 29 |
| Analogue input | 1 | 8 |
| Digital output | - | 4 |
| PWM prop.output | 2 | 2 |
| Output capacity | 2 Amp | 2 Amp |
| System bus | CAN bus | CAN bus |
| Communication | RS-232 | RS-232 |
| PC/terminal connection | Internal | Internal/external |
| Fuses | 2 x 4 Amp | 2 x 6 Amp |
| Approx. power consumption | 10 Watt | 20 Watt |
| Dimensions | 170x124x75 | 170x248x75 |
| Approx. weight | 2.5 kg | 4.0 kg |

| IN GENERAL | |
|---|---|
| Power supply | 11-30 Volt DC |
| Type of print clamp | Amp, 1½ $mm^2$ stainless clamps |
| Density | IP65 |
| Temperature area | -30°C through 70°C |
| EMC | According to EN50081-1 and EN50082-1 |