

1 Introduction

1.1 General

The frequency controlled hydraulic drive differs from a conventional one in as far as motor / pump run at variable speeds.

- Up travel:
 - Only the required amount of oil to achieve the travel speed is supplied (conventional: constant quantity / bypass)
 - Controlled oil flow = less electrical energy
 - No bypass = less heating up of oil
- Down travel:
 - Motor driven by pump, i.e. motor used as generator
 - Part of potential energy converted back into electrical energy (amount depending on motor / pump efficiency)
 - Generated electrical energy converted into heat through resistors of fed back into mains
 - Less oil heating

1.2 Beringer system

- System base on LRV-1 technology
 - Simple construction, only two sensors (flow meter and encoder)
 - Standard pumps and motors used
 - Cost effective

2 Functional description

2.1 General

- Only two sensors used:
 - Flow meter
 - Encoder for motor
- Flow meter:
 - Control of independence of load and oil viscosity (constant travel times under all conditions)
- Control card:
 - Digital technology, controls inverter and valve simultaneously

2.2 Up travel

(also refer to 3, 3.1)

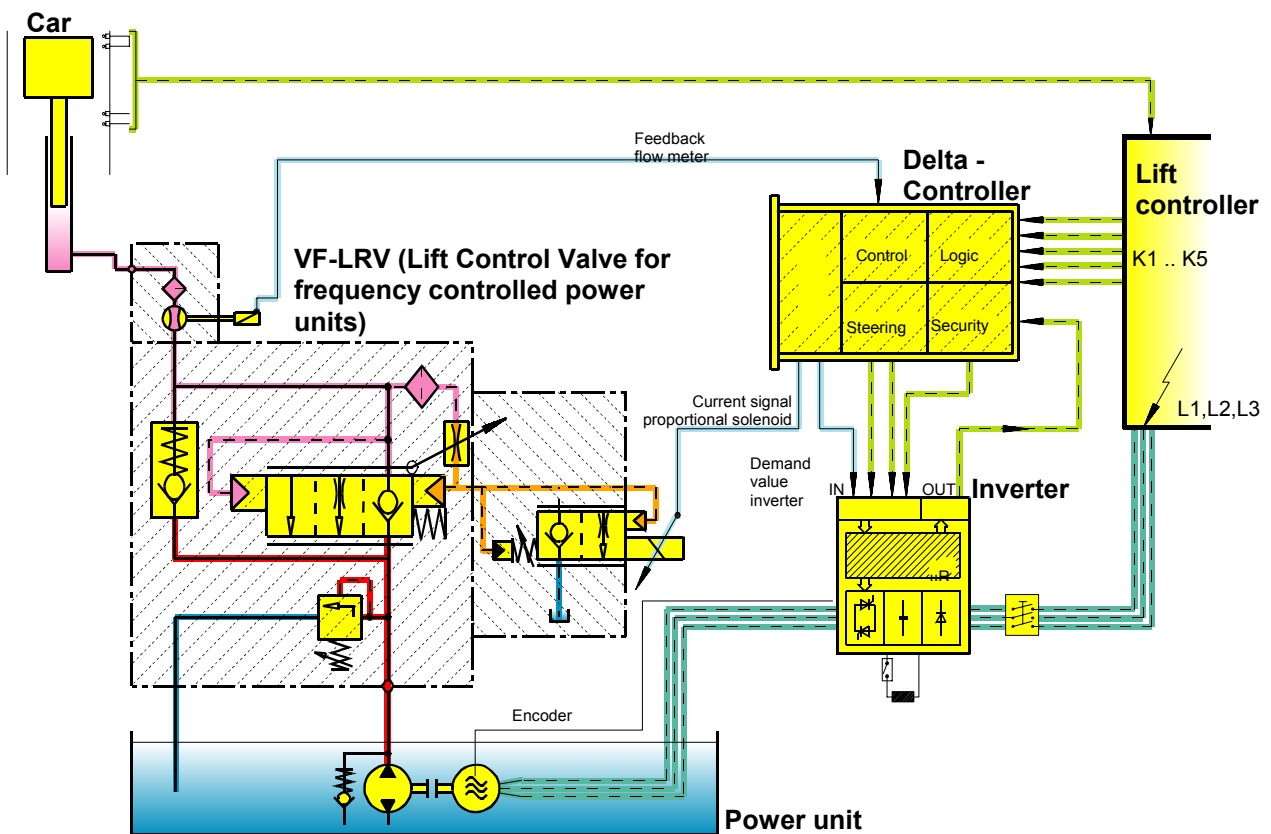
- Demand values set on digital electronic card „Delta Controller“
- Entire up travel controlled through inverter (19) and motor / pump revolutions
- Actual speed measured by flow meter (29), feed-back controlled by digital electronic card (5)
 - At start-up, motor (21) turning slowly, pressure between pump (22) and valve (3) increasing
 - If pump pressure exceeds system pressure, check valve (28) opens
 - If pump pressure below system pressure, check valve closing and elevator stops

2.3 Down travel

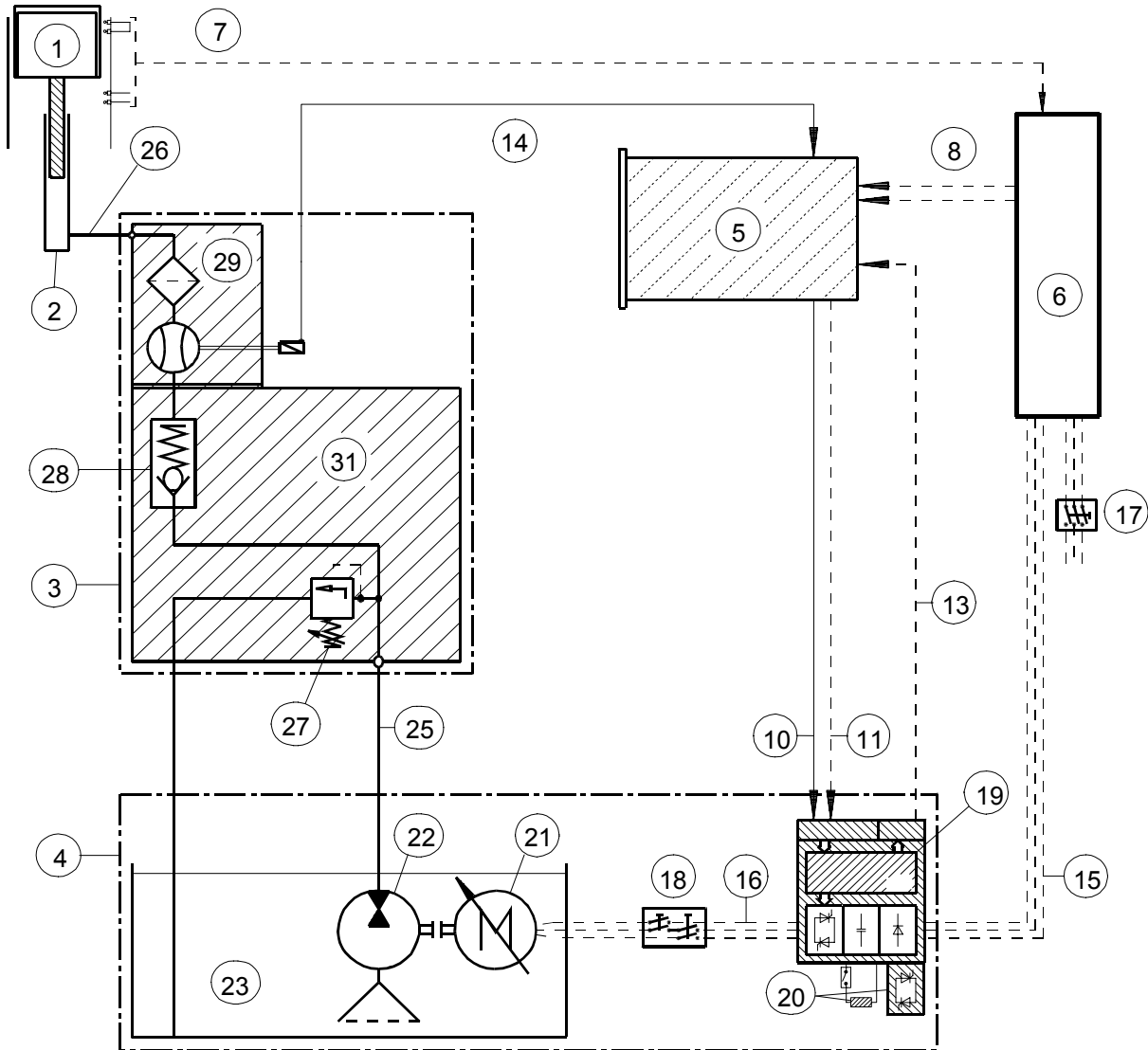
(also refer to 3, 3.2)

- Demand values set on digital electronic card „Delta Controller“
- Down travel controlled by valve during acceleration and deceleration / stop
- Rest of travel controlled through inverter and digital electronic card and motor / pump revolutions
 - Down start: Pilot valve (34) opened through proportional solenoid (35) and actuating main valve (33)
 - Through suction valve (24) pump fed with oil immediately
 - At a certain speed, main valve opens completely, speed control taken over by inverter, pump / motor
 - Pump acting as hydro-motor and driving motor which acts as generator
 - Electrical energy fed back to inverter and converted into heat through brake resistor (20) (For higher power recuperation into mains possible)
 - At deceleration, pilot valve closing main valve continuously, final deceleration and stop controlled through valve

3 System overview



3.1 Scheme „up travel“



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|-----------------------------|-------------------------------|---------------------------|
| 1. car | 11. forward signal | 21. motor |
| 2. cylinder | 13. security signal | 22. pump |
| 3. valve | 14. flow feedback | 23. oil tank |
| 4. power unit | 15. mains | 25. pump pipe |
| 5. digital electronic- card | 16. motor cable | 26. cylinder pipe |
| 6. lift controller | 17. main switch | 27. pressure relief valve |
| 7. shaft switches | 18. motor switches | 28. check valve |
| 8. travel commands | 19. inverter | 29. flow meter |
| 10. demand value inverter | 20. brake- or recuperate unit | 31. valve body |

