



Reachstackers 45 tonnes



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Workshop Manual in original

WORKSHOP MANUAL

DRT 450



Workshop Manual

DRT 450

| |
|---|
| A Foreword |
| B Safety |
| C Preventive maintenance |
| 0 Complete machine |
| 1 Engine |
| 2 Transmission |
| 3 Driveline/axle |
| 4 Brakes |
| 5 Steering |
| 6 Suspension |
| 7 Load handling |
| 8 Control system |
| 9 Frame, body, cab and accessories |
| 10 Common hydraulics |
| 11 Common electrics |
| 12 Common pneumatics |
| D Error codes |
| E Schematics |
| F Technical data |
| G Terminology and index |

Contents A Foreword

| | |
|--|------------|
| Foreword | A:3 |
| About the Workshop Manual..... | A:3 |
| General | A:3 |
| Conditions | A:3 |
| Storage..... | A:3 |
| About machine version..... | A:3 |
| Copyright..... | A:3 |
| Reading instructions | A:4 |
| Warning information | A:4 |
| Important information | A:4 |
| Read operator's manual | A:4 |
| Read the Maintenance manual | A:4 |
| The workshop manual's contents..... | A:5 |
| Function group structure | A:6 |
| References between different information types | A:7 |
| Product alternatives and optional equipment | A:8 |
| Machine card..... | A:9 |
| Function descriptions | A:10 |
| About the documentation | A:12 |
| The documentation's parts | A:12 |
| Ordering documentation..... | A:12 |
| Feedback | A:13 |
| Form for copying | A:13 |

A Foreword

About the Workshop Manual

General

Thank you for choosing Cargotec as your machine supplier. We hope that we will meet your expectations.

Conditions

The instructions are based on the use of generally available standard tools. All lifting devices, such as slings, straps and ratchet blocks, must meet the national standards and regulations in force for lifting devices.

Cargotec will not accept any responsibility in the event of a modification performed without permission from Cargotec. Further, Cargotec will not accept any responsibility if other lifting devices, tools or work methods are used other than those described in this manual.

Storage

NOTE

The workshop manual should be accessible to service personnel.

About machine version

The information in this publication corresponds with the machine's design and appearance on delivery from Cargotec. Deviations may arise due to customer adaptations.

Cargotec reserves the right to make changes to specifications and equipment without prior notice. All information and data in this manual are valid at the time of publication.



DANGER

External equipment may only be used if it is approved by Cargotec.

Extreme hazard to personal health and risk of property damage!

Only use equipment that is approved by Cargotec.

Copyright

Cargotec Sweden AB

Duplication of the content in this manual, in whole or in part, is strictly prohibited without written permission from Cargotec Sweden AB.

All duplication by any means, such as copying, printing, etc., is prohibited.

Reading instructions

Warning information

Warnings provide information about potential dangers that, if the warnings are not followed, could result in injury or product damage.



DANGER

Situation that could lead to severe personal injury or death if regulation is not followed.



WARNING

Situation that could lead to personal injury if regulation is not followed.



CAUTION

Situation that could lead to product damage if regulation is not followed.

Important information

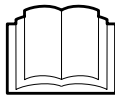
Important information is denoted with NOTE and is intended to facilitate the work process, handling or to increase understanding of the information.

NOTE

Important information not related to safety.

Read operator's manual

The symbol to the left is used in certain cases on the machine and refers to important information in the operator's manual.



Read the operator's manual

000262

Read the Maintenance manual

The symbol to the left is used in certain cases on the machine and refers to important information in the Maintenance manual.



Read the Maintenance manual

001128

The workshop manual's contents

The workshop manual contains information to facilitate maintenance (part replacement) and is a supplement to the maintenance manual. Accompanying the workshop manual is supplier documentation for engine, transmission and drive axle. Where possible, the workshop manual provides reference to supplier documentation instead of printing the same information twice. Methods for preventive maintenance and certain checks are found in the maintenance manual, no references are given for these. Use the function groups to locate the information in the maintenance manual.

The workshop manual is divided into the following sections.

| | | |
|----|----------------------------------|---|
| A | Foreword | General information about the workshop manual's purpose, contents and reading instructions as well as survey for feedback of views and any inaccuracies. |
| B | Safety | Keep in mind for your safety. |
| C | Preventive maintenance | Reference to maintenance manual: Preventive maintenance. |
| 0 | Complete machine | <p>Technical description, comprehensive function descriptions and a description of the function of components included in the machine, divided into function groups.</p> <p>The components used for each respective function are described under each subfunction. Consequently, common components are described in several locations, but in general under the first function to use the component.</p> <p>Together with the general description is a detailed description of what is unique about the specific subfunction. The next subfunction to use the same component only has a description what is unique for the new function.</p> <p>Work instructions for corrective maintenance (replacement of components).</p> |
| 1 | Engine | |
| 2 | Transmission | |
| 3 | Power transmission | |
| 4 | Brakes | |
| 5 | Steering | |
| 6 | Suspension | |
| 7 | Load handling | |
| 8 | Control system | |
| 9 | Frame, body, cab and accessories | |
| 10 | Common hydraulics | |
| 11 | Common electrics | |
| 12 | Common pneumatics | |
| D | Error codes | Error code information and instructions for reading error code information. |
| E | Schematics | Wiring diagrams, hydraulic diagrams and list of electrical components. |
| F | Technical data | Technical data, conversion tables, information for conversion of units. |
| G | Terminology and index | General terminology and abbreviations, explanation of terms and abbreviations that can appear in the sections, index for headings in the manual. |

Function group structure

The information in the manual is divided in a structure of functions at different levels, based on the machine's design and use, called function groups.

The upper level (called main group) determines area, e.g. group 7 Load handling. The second level (called two-digit) determines function, e.g. 7.2 Lifting/lowering. The third and fourth levels are used to break down functions into smaller parts (components).

The function groups' structure for main group and two-digit group level are common for all machines from Cargotec, e.g. 4.3 Power-assisted brake system. Machine-unique adaptations of function groups are made at the third and fourth group level, e.g. 4.3.9 Wheel brake and 4.3.9.1 Disc pack. This means that certain function groups (headings) will be left out in the documentation for certain machines since the machine is missing that specific function or component. In turn, this means that there may be jumps in the function groups' numbering, e.g. the three-digit heading level 4.8.7 Oil cooler may be included for some machines, but is missing for others.

The function groups are intended to be used as search terms in order to find different types of information between different sections and manuals. The information in a function group is divided in smaller sections according to the type of content, e.g. description or replacement.

The maintenance manual and workshop manual contain different information. The maintenance manual only contains the information needed for preventive maintenance and simpler troubleshooting. The workshop manual contains more in-depth information and repair instructions.

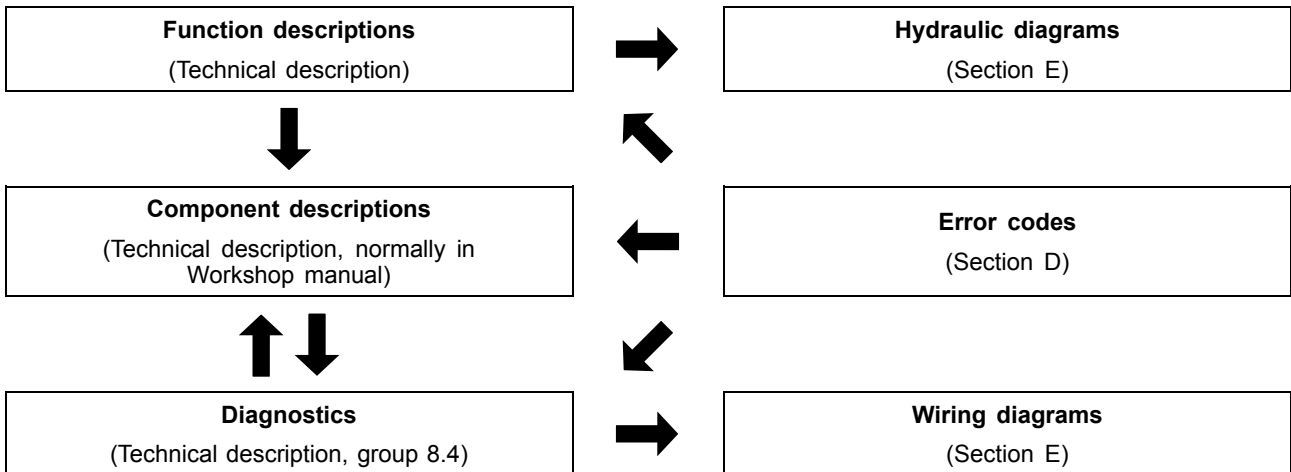
References between sections in the same manual are indicated with section and group number, e.g., "see section 4 *Brakes*, group 4.3.9 *Wheel brake*". References within a section are indicated with a page number, e.g. "see *Sensor fuel level, description page 24*".

References between Maintenance manual and Workshop manual are not given. If more information about a function group is required then the primary recommendation is to search under the same function group in the other manual. For more in-depth information on where different types of information are located and what references are made, see *References between different information types*, page A:7.

References between different information types

The maintenance manual and workshop manual are mainly divided into function groups, see *The workshop manual's contents*, page A:5. Certain parts are broken out as separate parts to increase usability, e.g. "Technical data".

The basic rule of searching for information is to use the function groups to find different types of information regarding the function or component in question. As a complement to this, there are references in accordance with the below.



- From Function description to Component description, to enable fast finding of more information about the different components that create a function.
- From Function description to Hydraulic diagram, to enable fast finding of the right hydraulic diagram for the function in question.
- From Component description or Function description to Diagnostics, to enable fast finding of the right diagnostic menu that can be used to check the component (only applies to electrical components).
- From Diagnostics to Wiring diagrams, to enable fast finding of the right circuit diagram for further troubleshooting.
- From Diagnostics to Component description or Function description, to enable fast finding of more information about the component's appearance and position when troubleshooting.
- From Error codes to Diagnostics, to enable fast finding of the right diagnostic menu to troubleshoot component or function in question.
- From Error codes to Function description or Component description, to enable fast finding of more information about components or function.

Product alternatives and optional equipment

The information in the manual is divided into modules. If a product alternative or optional equipment is fitted, handling may differ from that indicated in the modules depending on what is being described. See below.

Special equipment is not described in the manual. If uncertain as to what equipment is fitted to the machine, use the machine card to determine which information is relevant. See *Machine card*, page A:9.

Product alternative

Product alternative describes options that are fitted instead of a specific piece of standard equipment (e.g. engine alternative).

Equivalent information for different product alternatives is described consecutively in separate segments within the same function group. To indicate that there are different alternatives, "Product alternative" is added to the heading together with a simple description of the alternative, e.g. "(Product alternative Climate control system ECC)". In addition, the alternative that is an option is marked with the symbol for optional equipment.

Optional equipment

000264 Optional equipment refers to options that can be added to standard equipment for more or improved functions.

Information on auxiliary equipment is described in separate segments together with the standard equipment as the basis. The optional equipment description covers how the equipment option affects the standard function and what additional components are involved.



Symbol for optional equipment

Machine card

NOTE

If the machine has been modified after delivery, information on the machine card may be incomplete or incorrect.

IMPORTANT

Modifications made to the machine must be reported to Cargotec so that the machine card can be updated. A new updated machine card is sent when the customer requests this.

The machine card indicates of which drawings the machine consists. In many cases these can be associated with options and product alternatives. For more information about handling of product alternatives and optional equipment, see *Product alternatives and optional equipment*, page A:8. The machine card is supplied with the spare parts catalogue.

The machine card is divided in the same function groups as the spare parts catalogue, maintenance and workshop manuals. For practical reasons, the machine card only uses the first and second level in the function group register. The function groups are written in groups of four characters, e.g. group 0107 corresponds to group 1.7 Cooling system in the manual.

For more information about how the machine card is used for ordering spare parts, see the spare parts catalogue's foreword.

If the information on the machine card is not of any assistance, contact Cargotec.

NOTE

All documents that accompany the machine are non-registered documents and there will be no notification of changes.

Function descriptions

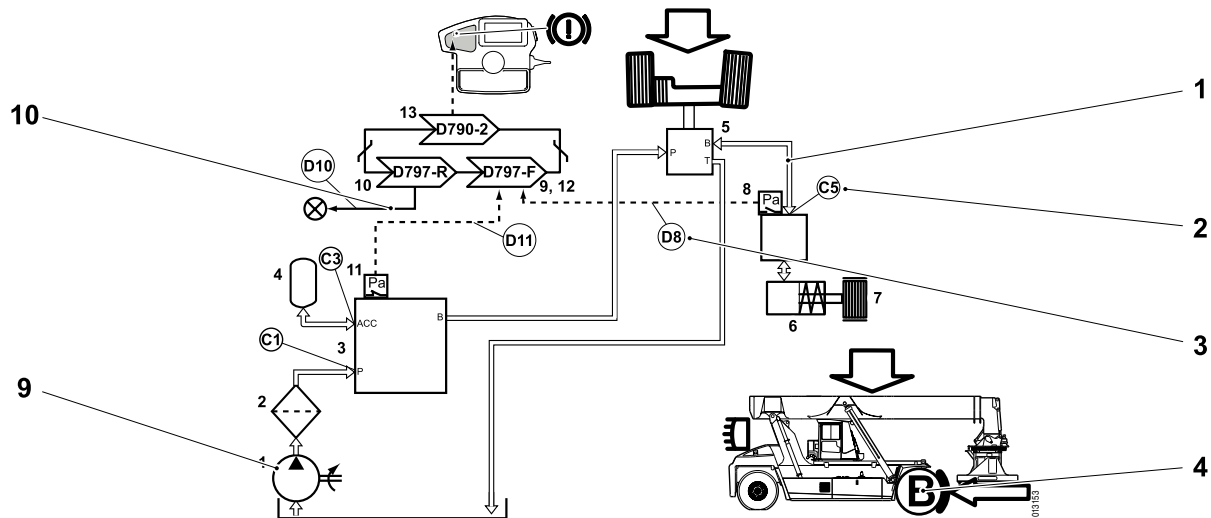
The function descriptions are schematic overviews that describe how a function works as well as which components and signals work together.

The function descriptions describe the function in a logical flow from input signal to desired output signal. Most functions require that preset conditions are fulfilled for the function to be activated. In these cases, the conditions are listed above the illustration.

The function descriptions use symbols to illustrate components such as valves, sensors, etc.

4.3 Servobromssystem

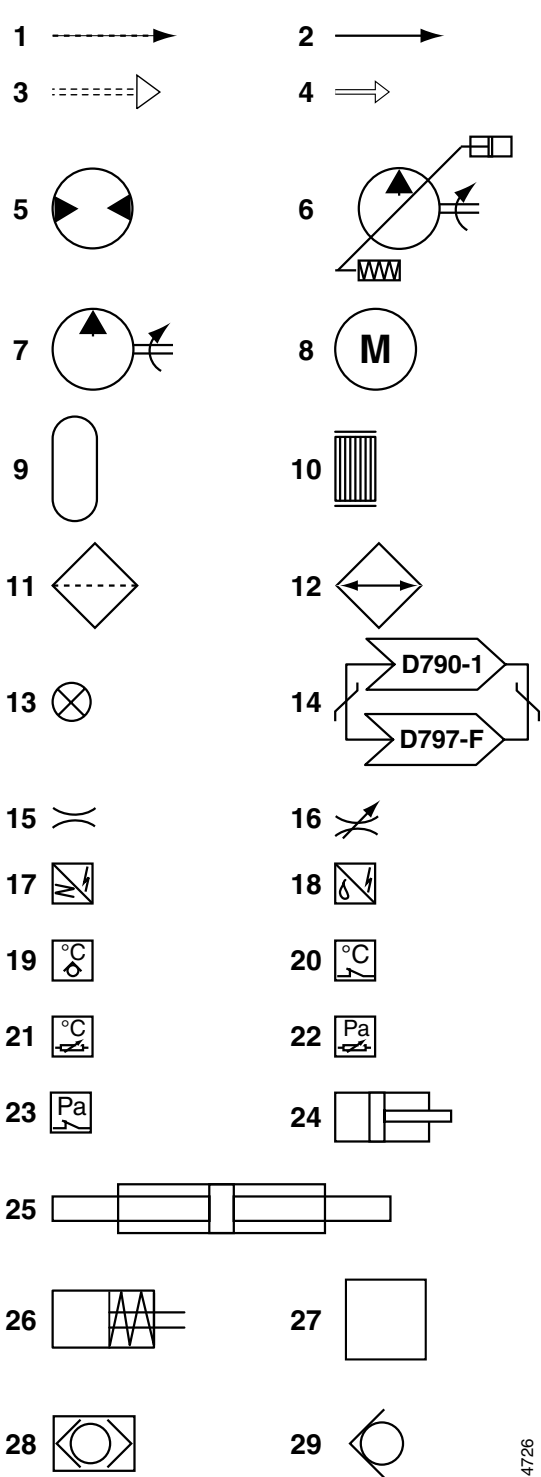
Servobromssystem, funktionsbeskrivning



| Pos | Förklaring | Signalbeskrivning | Hänvisning |
|-----|--|--|--|
| 1 | Bromsöljepumpen pumpar olja från bromsöletanken. | $P = 20,5 \pm 1,0 \text{ MPa}$ | Bromsöletank, beskrivning, sida 36 Bromsöljepump, beskrivning, sida 6 |
| 2 | Bromsöljefiltre renar oljan. | - | Bromsöljefiltre, beskrivning, sida 41 |
| 3 | Akkumulatorladdningsventilen styr olja till laddning av ackumulatörerna eller genom bromssystemets kylkrets. | - | Akkumulatorladdningsventil, beskrivning, sida 10 |
| 4 | Akkumulatörerna lagrar oljetryck. | Se trycksylt Akkumulatortryck bromssystem, på vänster rambalk. | Akkumulator, beskrivning, sida 13 |
| 5 | Bromsventilen styr tryck från ackumulatörerna till bromscylindrarna proportionellt mot pedaltrycket. | - | Bromsventil, beskrivning, sida 17 |
| 6 | Bromscylindrarna pressar samman lamellerna i bromsenheten. | Se trycksylt Bromstryck, på vänster rambalk. | Hjulbroms, beskrivning, sida 25 |
| 7 | Hjulbromsarna bromsar maskinen. | - | Hjulbroms, beskrivning, sida 25 |

Example of function description

- Hydraulic force (solid double line)
- Flag measuring outlet (Check point), indicates that there is measuring outlet for checking the pressure signal
- Flag diagnostic test, indicates that the signal can be checked with diagnostics, see section 8 *Control system*, group 8.4 *Diagnostics*
- Illustration of function, (applied brake)
- Reference to description of component
- Signal description, reference value for signal out from component
- Description of the component's function
- Position number, reference to position in illustration
- Position number in illustration, reference to row in table
- Electric power (solid single line)



Symbol explanation function descriptions

The following symbols are used in function descriptions. The symbols are based on standard symbols for wiring and hydraulic diagrams.

- 1. Electric control signal
- 2. Electric force
- 3. Hydraulic control signal
- 4. Hydraulic force
- 5. Hydraulic motor
- 6. Hydraulic oil pump with variable displacement
- 7. Hydraulic oil pump with fixed displacement
- 8. Electric motor
- 9. Accumulator
- 10. Disc brake
- 11. Filter
- 12. Radiator
- 13. Bulb
- 14. Control and monitoring system, two control units with CAN bus
- 15. Restriction
- 16. Adjustable restriction
- 17. Inductive position sensor
- 18. Electrically controlled servo valve
- 19. Thermal bypass valve
- 20. Temperature-controlled switch
- 21. Temperature sensor
- 22. Pressure sensor
- 23. Pressure-controlled switch
- 24. Hydraulic cylinder
- 25. Double-acting hydraulic cylinder
- 26. Spring brake cylinder
- 27. Valve block
- 28. Shuttle valve
- 29. Non-return valve

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About the documentation

The documentation's parts

The documentation for the machine consists of the following parts:

Operator's manual

The operator's manual is delivered with the machine in the cab.

Documentation kit

Maintenance manual and spare parts catalogue with machine card are supplied for the machine as a separate documentation kit.

Supplementary documentation

There is supplementary documentation that can be ordered for the machine.

- Workshop manual.
- Supplier documentation for engine, transmission, and drive axle.

Ordering documentation

Documentation is ordered from your Cargotec dealer.

Always indicate publication number when ordering.

For publication number, see machine card.

Feedback

Form for copying

Cargotec's ambition is that you who work with maintenance of Kalmar machines shall have access to correct information.

Your feedback is important to be able to improve the information.

Copy this form, write down your views and send it to us. Thanks for your help!

| | |
|--|--|
| To: | Cargotec Sweden AB Technical Documentation Torggatan 3 SE-340 10 Lidhult SWEDEN Fax: +46 372 263 93 |
| From: | Company / Sender: Phone: E-mail: Date: - - |
| Manual information | Name / Publication number: Section / page number: |
| Sug- ges- tions, views, re- marks, etc. | |

Contents B Safety

| | |
|--|------------|
| Safety | B:3 |
| General safety information..... | B:3 |
| Safety concerns everyone!..... | B:3 |
| A near accident is a warning! | B:3 |
| Safety instructions..... | B:4 |
| General | B:4 |
| Service position | B:4 |
| Hydraulic and brake systems, depressurising..... | B:5 |
| Oils | B:6 |
| Fuel system | B:7 |
| Clothing, etc. | B:8 |
| Several mechanics on the same machine..... | B:8 |
| Working under the machine | B:8 |
| Lifting heavy components | B:9 |
| Vibration | B:9 |
| Noise | B:10 |
| Dissolvent..... | B:10 |
| Fire and explosion risk | B:11 |
| Fluid or gas under pressure | B:13 |
| Coolant..... | B:13 |
| Refrigerant | B:14 |
| Air pollution | B:14 |
| Tensioned springs | B:15 |
| Electric motors | B:15 |
| Rotating components and tools..... | B:15 |
| Tyres and rims..... | B:16 |
| Lifting equipment..... | B:17 |
| Spare parts..... | B:17 |
| Non-ionised radiation | B:18 |
| Environment..... | B:19 |
| General | B:19 |

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