





Workshop manual

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 Terminologi och Index

Table of Contents A Foreword

Foreword	3
About the Workshop Manual	3
General	3
Conditions	3
Storage	3
About the machine version	3
Copyright	3
Reading instructions	4
Warning information	4
Important information	4
Read the Operator's Manual	4
Read the Maintenance Manual	4
Workshop manual contents	5
Function group structure	6
References between different information types	7
Product alternatives and optional equipment	8
Machine card	8
Function descriptions	9
About the documentation	12
Documentation sections	12
Ordering of documentation	12
Feedback	13
Form for copying	13

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 governing national standards and regulations for lifting devices.

Cargotec will not accept any responsibility for modifications performed without permission from Cargotec, or in the event of the use of lifting devices, tools or work methods other than those described in this manual.

Storage

NOTE

The workshop manual should be accessible to service personnel.

About the machine version

The information in this publication corresponds to the machine's design and appearance at the time of delivery from Cargotec. Due to customisations, there may be variations and/or deviations.

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



DANGER

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

Danger to life and property!

Only use equipment 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.

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

Reading instructions

Warning information

Warnings inform on potential dangers which can, if the warnings are not heeded, result in personal injury or product damage.

DANGER

Situation that may result in serious personal injury, possible death, if the instruction is not followed.

WARNING

Situation that may result in serious personal injury if the instruction is not followed.

CAUTION

Situation that may result in damage to the product if the instruction is not followed.

Important information

Important information marked with NOTE facilitates the work process, operation/handling or increases understanding of the information.

NOTE

Information that is important without being safety related.

Read the 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 sometimes found on the machine. It refers to important information in the Maintenance Manual.



Read the Maintenance Manual

001128

Workshop manual 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. If 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. 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 function are described under each subfunction. Consequently, common components are described in several places, 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	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	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 into a structure of functions at different levels based on machine structure and usage. The categories are known as function groups.

The highest level (called main group) indicates area, such as group 7 Load handling. The second level (called two-position) indicates function, such as 7.2 Lifting/lowering. The third and fourth levels are used to break down functions into smaller parts (components).

The main group and two-position group level structure for the function groups is used for all Cargotec machines, e.g. 4.3 Power-assisted brake system. Machine-specific function group adaptations are done at the third and fourth group level, e.g. 4.3.9 Wheel brake and 4.3.9.1 Disc assembly. Function groups (headings) are only included in the documentation of a machine if the machine has that function or component. Thus, there may be gaps in function group numbering, e.g. the three-position heading level 4.8.7 Oil cooler is included for some machines but not for others.

The function groups are intended as a search term to be able to find various types of information between different sections and manuals. The information of a function group is divided into smaller segments based on type of content, such as description or replacement.

The Maintenance Manual and Workshop Manual contain different information. The Maintenance Manual only contains information required for preventive maintenance and minor troubleshooting. The Workshop Manual contains more in-depth information and repair instructions.

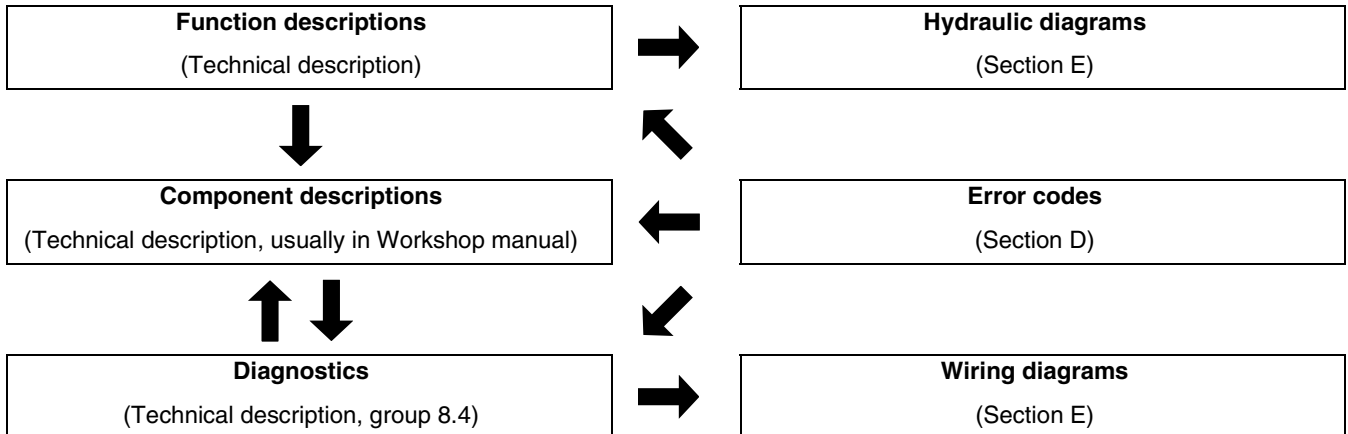
References between sections in the same manual are indicated using section and group number, e.g., "see section 4 *Brakes*, group 4.3.9 *Wheel brake*". Reference within a section are indicated with page number, e.g., "see *Sensor fuel level, description page 24*".

There are no references between the Maintenance Manual and Workshop Manual. If more information on a function group is required, 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 7*.

References between different information types

The maintenance manual and workshop manual are mainly divided into function groups, see *Workshop manual contents page 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 function groups to find different types of information regarding the function or component in question. As a complement to this, there are references according to 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 8*.

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 are 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

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. The optional equipment description covers how the equipment affects standard function and what components are added.

Machine card

NOTE

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

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

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

For more information on how the machine card is used to order spare parts, see the foreword of the spare parts catalogue.

If the information on the card machine does not help, contact Cargotec.



Symbol for optional equipment

000264

NOTE

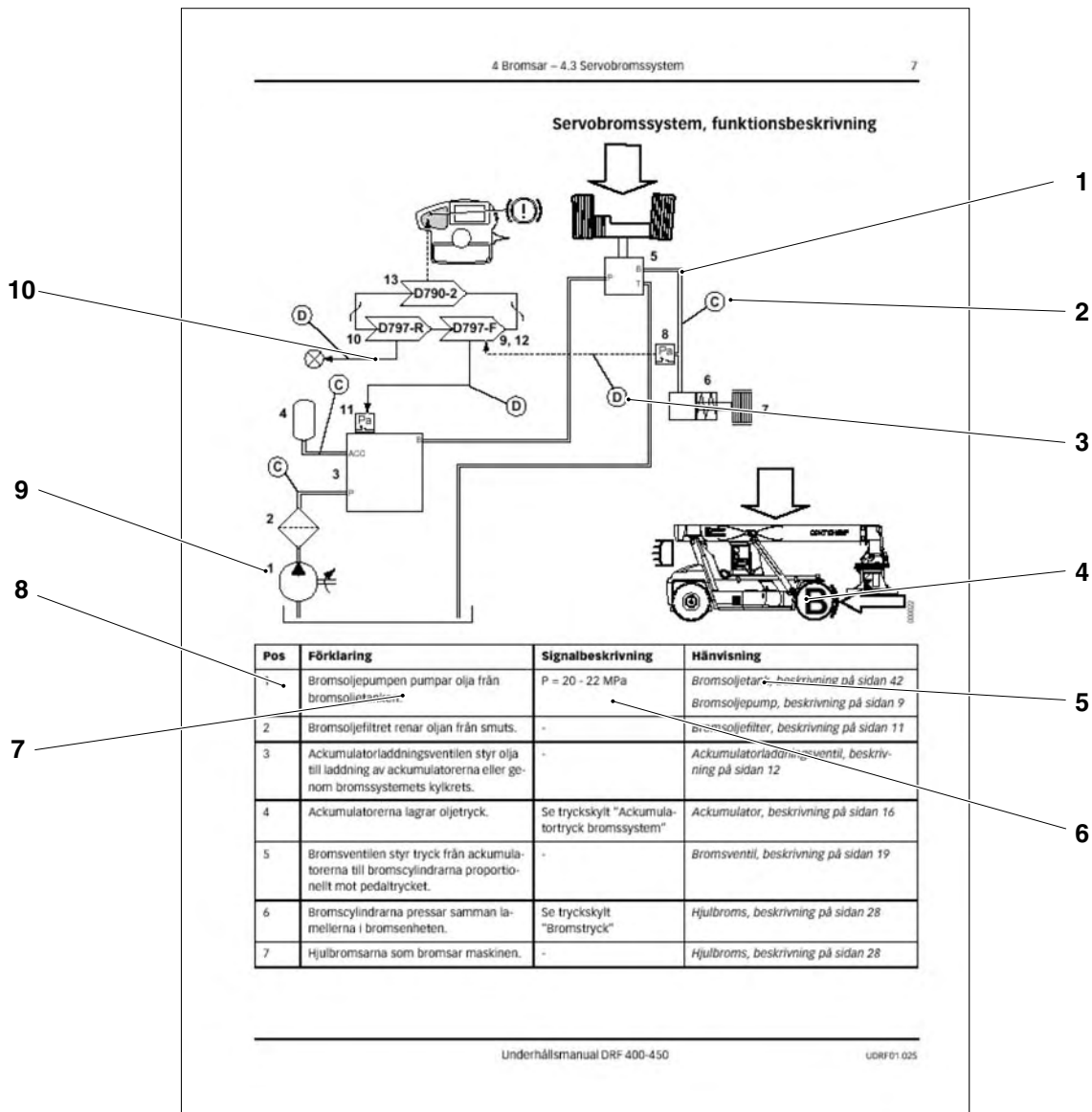
All documents that accompany the machine are non-registered documents. No notification is made regarding changes.

Function descriptions

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

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.

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

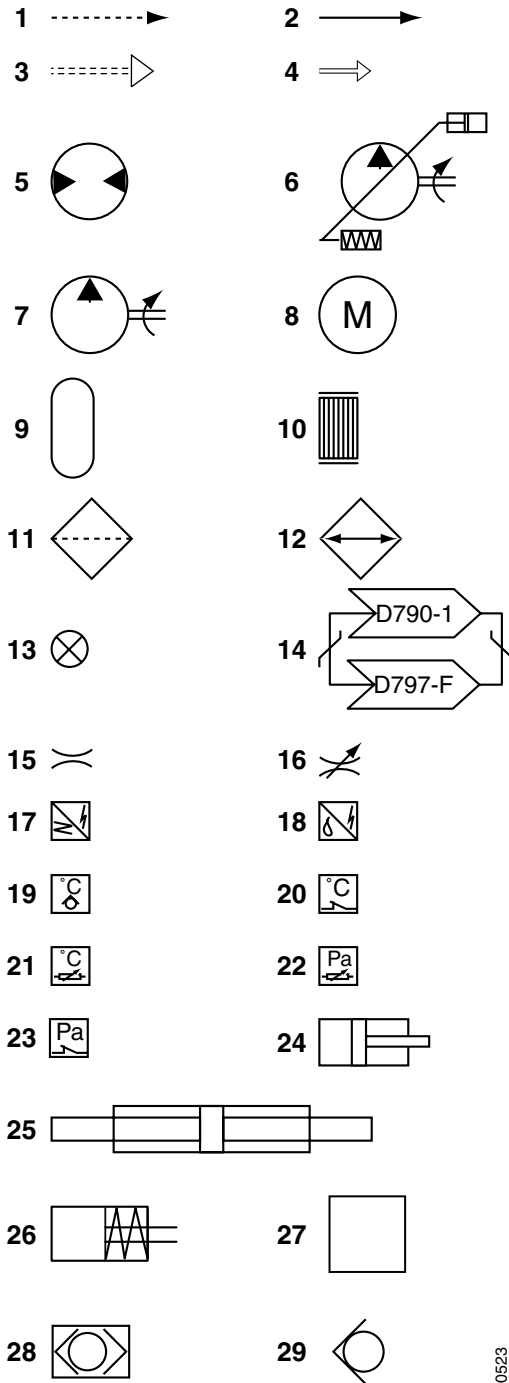


Example of function description

1. Hydraulic force (solid double line)
2. Flag pressure check connection (Check point), indicates that there is pressure check connection for checking pressure signal
3. Flag diagnostic test, indicates that the signal can be checked with diagnostic test, see section *8 Control system*, group *8.4 Diagnostics*
4. Illustration of function, (apply brake)
5. Reference to description of component
6. Signal description, reference value for signal out from component
7. Description of component's function
8. Position number, reference to position in illustration
9. Position number in illustration, reference to row in table
10. Electric power (solid single line)

Symbol explanation function descriptions

The following symbols are used in function descriptions, the symbols are based on standard symbols used in 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 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

000523

About the documentation

Documentation sections

The documentation to the machine comprises the following sections:

Operator's manual

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

Documentation kit

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

Supplementary documentation

Supplementary documentation can be ordered for the machine.

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

Ordering of documentation

Documentation is ordered from your Cargotec dealer.

Always specify the publication number when ordering.

See the machine card for publication number.

Feedback

Form for copying

Cargotec's ambition is that you who work with maintenance of a Kalmar machine 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. Thank you for your participation!

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From:	Company / Sender: Telephone: E-mail: Date: - -
Manual information	Name / Publication number: Section / page number:
Suggestions, views, remarks, etc.

Table of Contents B Safety

Safety	3
General safety information	3
Safety concerns everyone!	3
A near accident is a warning!	3
Safety instructions	4
General	4
Service position	4
Hydraulic and brake systems, depressurising	5
Oils	6
Fuel system	7
Clothing, etc.	8
Several mechanics on the same machine	9
Working under machine	9
Lifting heavy components	10
Vibrations	10
Noise	11
Solvents	11
Fire and explosion risks	12
Fluid or gas under pressure	13
Coolant	14
Refrigerant	14
Air pollution	15
Tensioned springs	16
Electric motors	16
Rotating components and tools	17
Tyres and rims	18
Lifting equipment	18
Spare parts	19
Non-ionised radiation	20
Environment	21
General	21

