



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

A 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 operator's manual	4
Read 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	9
Function descriptions	10
About the documentation	13
Documentation sections	13
Ordering of documentation	13
Feedback	14
Form for copying	14

A Foreword

About the Workshop Manual

General

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

Conditions

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

Cargotec will not accept any responsibility for modifications performed without permission from Cargotec or 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 the 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 customizations, 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.

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.



DANGER

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

Risk of fatal accidents and property damage!

Only used equipment approved by Cargotec.

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

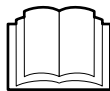
Important information marked with NOTE facilitates the work process, operation/handling or increases understanding of the information.

NOTE

Information that is important without being safety related.

Read 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 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

Workshop manual contents

The Workshop Manual contains information to facilitate maintenance (part replacement) and is a supplement to the Maintenance Manual. The supplier documentation for engine, transmission and drive axle also supplements the Workshop Manual. 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 and hydraulic diagrams
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 sections.

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 and lowering. The third and fourth levels are used to break down functions in 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 and 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 to be used as search terms 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 change.

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

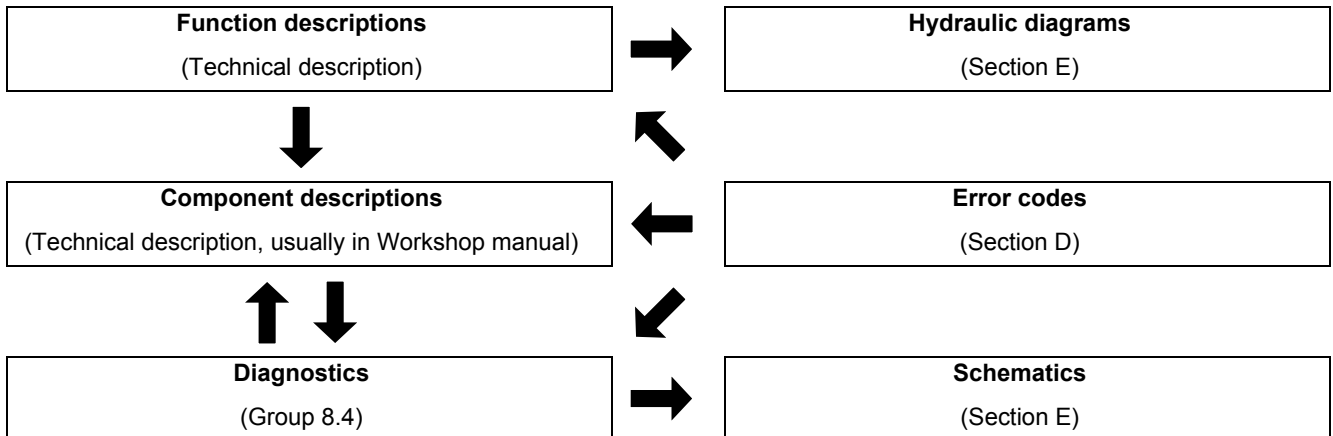
References between sections in the same manual are indicated with section and group number, e.g., "see section 4 Brakes, group 4.3.9 Wheel brake ". References within a section are indicated with a page number, e.g., "see *Sensor fuel level, description page 24* ".

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 Schematics, 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 in modules. For product alternatives and optional equipment, handling of the modules differs depending on if it is the one or the other that is described, see below.

Special equipment is not described in the manual. If you're uncertain about what equipment the machine should have, use the machine card to decide which information applies, see *Machine card page 9*.

Product alternative

Product alternatives are such options that exclude certain 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 are options that can be added to the standard equipment to obtain additional or improved functions.

Information for optional equipment is described in separate sections with standard equipment as the starting point. The description of the optional equipment describes how the standard function is affected by the option as well as which components are added.



Symbol indicating optional equipment

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Machine card

NOTE

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

IMPORTANT

Changes made on the machine must be reported to Cargotec so that the machine card can be updated. A new updated machine card is sent on the request of the customer.

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 in the same functions groups as the parts catalogue, maintenance and Workshop manual. For practical reasons, the machine card uses only the first and second level in the function group register. The function groups are written in groups of four characters, e.g. group 0107 matches group 1.7 Cooling system in the manual.

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

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

NOTE

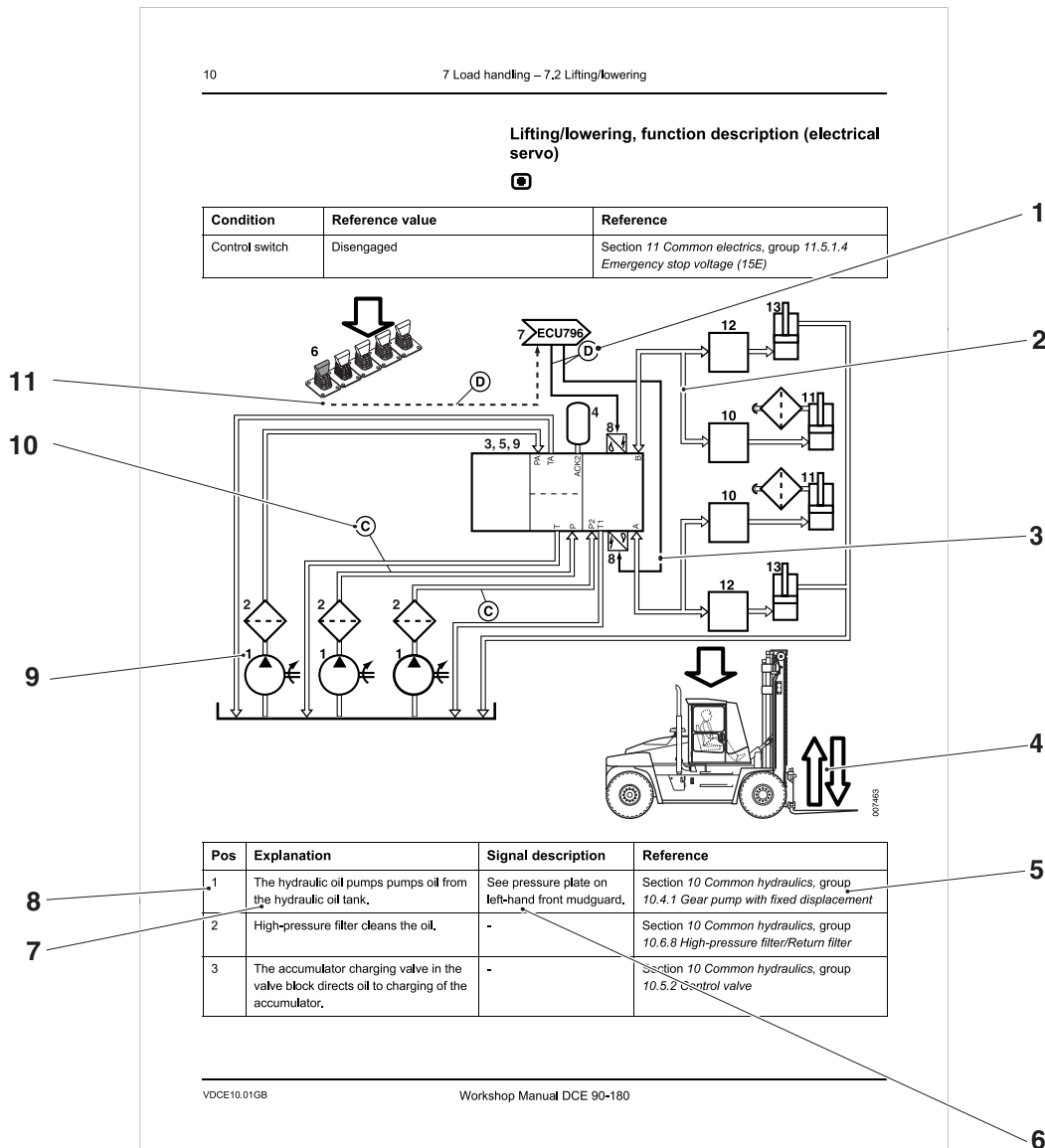
All documents that accompany the machine are non-registered documents and there will be no notification of changes.

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.

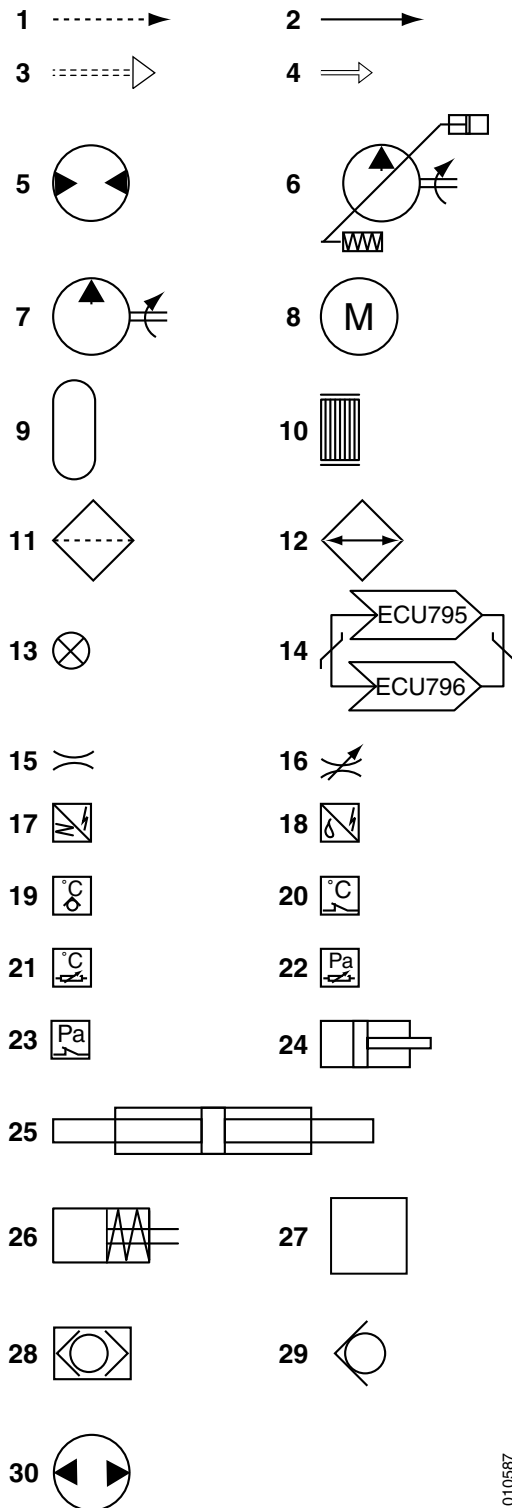


Example of function description

-
1. Flag diagnostic, indicates that signal can be checked with diagnostics, see *group "8.4 Diagnostics"*
 2. Hydraulic force (solid double line)
 3. Electric power (solid single line)
 4. Illustration of function, (lift and lower)
 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. Flag pressure check connection (Check point), indicates that there is pressure check connection for checking pressure signal
 11. Electric control signal (dashed 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. Electrical motor
9. Accumulator
10. Disc brake
11. Filter
12. Radiator
13. Bulb
14. Control system, two control units with CAN-bus
15. Restrictor
16. Adjustable restrictor
17. Inductive position sensor
18. Electrically controlled servo valve
19. Thermal by-pass 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. Spool valve
29. Non-return valve
30. Hydraulic oil pump (transmission)

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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

There are Supplementary documentation that can be ordered for the machine.

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

Ordering of documentation

Documentation is available for order from Cargotec dealers.

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 Cargotec 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. Thank you for your participation!

To:	Cargotec Sweden AB SE-341 81 Ljungby, Sweden. SWEDEN Fax: +46 372 263 90
From:	Company / Sender: Telephone: E-mail: Date: - -
Manual-information	Name / Publication number: Section / page number:
Sug- ges- tions, views, re- marks, 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 system, depressurizing	5
Oils	5
Fuel system	6
Clothing, etc.	7
Several mechanics on the same machine	8
Working under machine	8
Lifting heavy components	9
Vibrations	10
Noise	10
Solvents	11
Fire and explosion risks	12
Fluid or gas under pressure	14
Coolant	15
Refrigerant	16
Air pollution	17
Tensioned springs	18
Electric motors	18
Rotating components and tools	19
Tyre and rim system	20
Lifting equipment	20
Spare parts	21
Non-ionised radiation	22
Environment	23
General	23

Safety

General safety information

Safety concerns everyone!

The safety information concerns everyone who works with the machine! Persons who do not follow the safety instructions given in this manual must make absolutely sure that the work is performed without risks of personal injury and without risk of damage to machine or machine property!

Remember to:

- follow the instructions in this manual
- be trained for the work in question
- follow local laws, safety rules and regulations
- use the correct equipment and tools for the job
- wear the correct clothes
- use common sense and work carefully. Do not take any risks!

Cargotec has in this publication documented and warned for situations and risks that may occur in connection with using as well as service/repairs of the machine during normal circumstances.

That's why it's important that all who work with the machine, or repair/service the machine read and follow the information in the manuals.

A near accident is a warning!

A near-accident is an unexpected event where neither persons, machine or property are injured or damaged. However, a near-accident indicates that there is an injury risk and actions must be taken to avoid the risk of injuries.

Safety instructions

General

Read, consider and follow the safety instructions below before starting to work in the machine:

- *Service position page 4*
- *Hydraulic system, depressurizing page 6*
- *Oils page 6*
- *Fuel system page 7*
- *Clothing, etc. page 8*
- *Several mechanics on the same machine page 9*
- *Working under machine page 9*
- *Lifting heavy components page 10*
- *Vibrations page 11*
- *Noise page 11*
- *Solvents page 12*
- *Fire and explosion risks page 13*
- *Fluid or gas under pressure page 15*
- *Coolant page 16*
- *Refrigerant page 17*
- *Air pollution page 18*
- *Tensioned springs page 19*
- *Electric motors page 19*
- *Rotating components and tools page 20*
- *Tyre and rim system page 21*
- *Lifting equipment page 21*
- *Spare parts page 22*
- *Non-ionised radiation page 23*

Service position

General

Service position is used for service, maintenance and other situations when the machine needs to be secured.

Service position means: