DCVN94/104

Direct Current Drive Systems Solutions

User
Manual

Schneider Electric

Contents

DCVDOC100-EN_26-10-07

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1 - Safety instructions

When the power supply to the DC drive is on, the power units as well as a certain number of control components are connected to the power network.
It is extremely hazardous to touch them. The ventilation cover of the DC drive or the control module should be kept closed. The thyristor bridge of separate-bridge models should be protected against direct and indirect contact.

After cutting the DC drive power supply voltage, make sure that there is no residual voltage still present before working on the product.

Generally speaking, the DC drive power supply voltage should be cut prior to any work carried out on either the electrical or the mechanical part of the installation or the machine.
When in use the motor may be brought to a stop by suppression of standby conditions or speed reference, while the DC drive remains under power. If the safety of personnel makes it necessary to prohibit any premature restart, this electronic stop is insufficient.
Anticipate a disconnection on both the power circuit and on the brake if appropriate.

The DC drive may start automatically when power is applied to the power unit. You should ensure that no persons or equipment are put in danger. The DC drive includes security systems that can, in the event of a fault, stop the DC drive and therefore also stop motor. This motor may come to a stop on its own because of a mechanical blockage. Finally, variations in voltage, and power outages in particular, may be the reason for a stop. Removing the cause of a stop, may result in an automatic restart. This could present a risk for certain machines or installations and in particular those that must comply with safety regulations. It is thus important that the necessary precautions are taken by the operator or installation wiring to prevent an automatic restart, for example by using a low-speed detector, which will cut the power supply to the DC drive in the event of a non-programmed motor stop.

Fault management can be carried out by the DC drive in different ways.
Refer to the section on fault programming, Chapter 5.11.7.

The installation of equipment must comply with IEC standards.
The products and materials presented in this document may at any moment be subject to further development or change regarding both technical and operational aspects.
At no moment does their description serve to be contractual.

The DCVN●● DC drive should be considered to be a component; this is neither a machine nor a product ready for use according to European directives (machine directive and electromagnetic compatibility directive). It is the responsibility of the end customer to guarantee the conformity of his machine with these directives.
The installation and operation of this DC drive should be executed in accordance with the rules of the type conformant to international and national standards of its place of use. Such compliance is the responsibility of the installer, who must respect, among others, EMC and Low Voltage directives of the European Community.

1 - Safety instructions

Notes:

1. In the case of motor restart, the function must be activated (**Auto capture** in the menu **ADD SPEED FUNCT**).
2. It is prohibited to connect a capacitive load (such as compensation capacitors) to the output of the DC drive (earth terminals C and D).
3. Connect the DC drive to a grounding terminal (PE) via the earth terminals provided on the casing of the product. The leakage current towards the earth is higher than 3.5 mA. According to EN50178 standard, grounding connections should not be switchable.
4. The product should only be commissioned by qualified personnel. The power cable as well as the equipotential protection should be well sized, conforming to the national and local regulations. The motor must be protected against overload.
5. No dielectric strength test should be performed on the DC drive. A suitable measuring instrument (with an internal resistance of at least 10 kΩ/V) should be used to measure the voltage of the different signals.
6. When the DC drive is locked, but has not been isolated from the network (disconnect or contactor), it cannot be ruled out that the motor shaft may turn accidentally in the event of DC drive failure.

WARNING!

The DC drive is prone to deliver an RMS symmetrical short-circuit current, under 500V, that should not exceed the values below:

DC Drive size	Short-circuit current
20 ... 70 A	5 kA
110 ... 280 A	10 kA
350 ... 650 A	18 kA
770 A	30 kA
1000 ... 1050 A	42 kA
1400 ... 1500 A	100 kA
2000 A	150 kA
2700 A	200 kA
3000 A	200 kA

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2 - Presentation - General information

2.1 General description

Variable speed drives in the DCVN●4●●●● range are intended for control of speed or torque of separately excited direct current motors, with a rated armature current from 40 to 2700A. They are all equipped with an excitation current regulator.

· The product range is divided into 2-quadrant DC drives (DCVN94●●●●) and 4-quadrant DC drives (DCVN104●●●●) in the torque-speed design and can be powered by a 3 phase 400V or 500V network (class S), or from a 690V network (class Y).

· The DC drives are delivered together with a CD Rom containing multi-lingual documentation of operation and any applicable options.
· These DC drives are available in a compact version up to 1050A and with a separate bridge from 1050A onwards, meet the most demanding applications thanks to their durable construction, high-end performance of their digital controls, and numerous integrated functions:

- handling and lifting
- PID controllers
- winder /unwinder

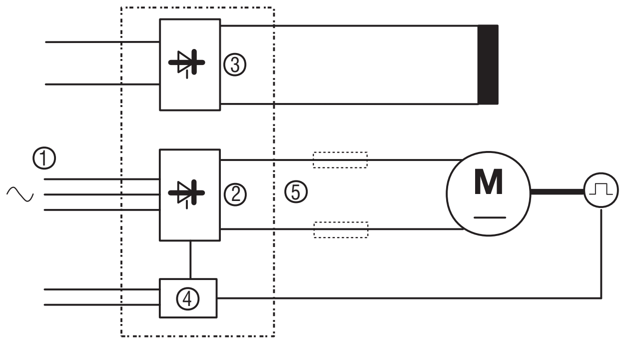


Figure 2.1.1 functional diagram of a DC drive.

① Power supply (U_{LN}):	3 x 230 V, 50/60 Hz 3 x 400 V, 50/60 Hz 3 x 440 V, 50/60 Hz 3 x 460 V, 50/60 Hz 3 x 480 V, 50/60 Hz 3 x 500 V, 50/60 Hz 3 x 690 V, 50/60 Hz
② Armature DC drive:	Fully controlled three-phase bridge. Converts AC into DC. (Single bridge for DCVN94...- double bridge for DCVN104...)
③ Excitation controller:	Semi-controlled single phase bridge
④ Control unit:	Supply, control, and power system regulation boards. Commands, references, and feedback are connected to it.
⑤ Output voltage (U_{dA}):	direct current variable from 0... U_{dAN}
Output current (I_{dN}):	40 ... 2700 A (for max ambient temperature of 40°C)

2.1 General description

2.1.2 DC drive sizes

Table 2.1.2.1: DC drive sizes.

DCVN104●●●●	Size	I induced permanent	DCVN94●●●●	Size	I induced permanent
DCVN104D40S	1	40A			
DCVN104D70S	1	70A	DCVN94D70S	1	70A
DCVN104C11S	1	110A	DCVN94C11S	1	110A
DCVN104C18S	1	185A	DCVN94C18S	1	185A
DCVN104C28S	1	280A	DCVN94C28S	1	280A
DCVN104C42S	2	420A	DCVN94C42S	2	420A
DCVN104C65S	2	650A	DCVN94C65S	2	650A
DCVN104C77S	3	770A	DCVN94C77S	3	770A
DCVN104M11S	3	1050A	DCVN94M10S	3	1000A
DCVN104M15S	4	1500A	DCVN94M15S	4	1500A
DCVN104M14Y	4	1400A	DCVN94M14Y	4	1400A
DCVN104M20S	4	2000A	DCVN94M20S	4	2000A
DCVN104M20Y	4	2000A	DCVN94M20Y	4	2000A
DCVN104M27S	4	2700A	DCVN94M27S	4	2700A
DCVN104M27Y	4	2700A	DCVN94M27Y	4	2700A
DCVN104M30S	4	3000A	DCVN94M30S	4	3000A
DCVN104M30Y	4	3000A	DCVN94M30Y	4	3000A

Tab 2.1.1

2.1.3 Functions and general features

DC drives rom the DCVN94/104 range feature excellent regulation performance and extensive functionality.

Integrated excitation control.

Galvanic isolation separates the power unit and regulation.

Galvanic isolation separates the regulation unit and the digital or analog inputs/outputs.

Differential analog inputs.

Display and programming module delivered in standard form and installed on the front face of the DC drive.

Simplified commissioning with short menu.

Control of the DC drive can be made:
- From the terminal block
- With the display programming module with backlit screen
- Through use of optional programming software DCVNCNF...
- By connection to a MODBUS RTU field bus

The last 10 faults messages are memorised and displayed on start-up.

Programmable management of the DC drive’s behaviour upon fault detection.

Revert automatically to Armature voltage feedback in the case of loss of speed feedback (only in constant torque mode) .

Overload control.

Three configurable analog inputs.

2 - Presentation - General information

2.1 General description

Extension of digital and analog inputs and outputs through use of the optional board DCVS5V62.

Expression of references and values measured in percentage or under another form than can be defined by the operator.

Possibility of speed and torque regulation.

Adaptive speed controller.

Armature-adapting current regulator.

Motorised potentiometer function.

Jog Function.

8 internal speed references.

5 internal linear ramps or S-ramps.

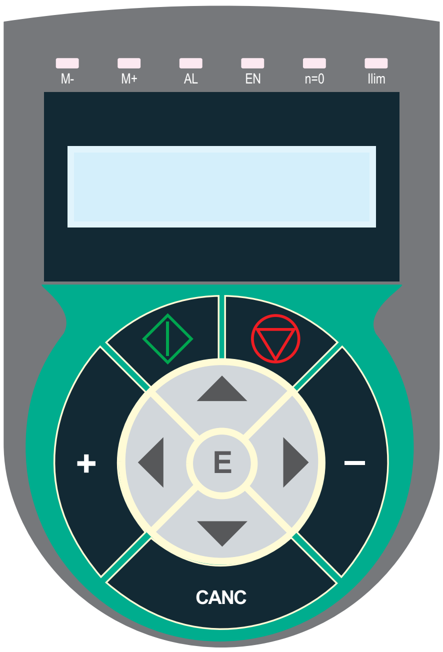
Internal signal conditioning (gains, limits min/max , offset....).

Extension of functions for specific applications through use of the optional DCVS5W04 board.
Connection to a CANopen field bus by use of the optional DCVS5Z27 board.

2.1 General description

2.1.4 Detachable display and programming module

Made up of an LCD display with two lines of 16 characters each, 10 function buttons, and 6 diagnostic LEDs.



It is used:
- to command the DC drive when this mode has been selected,
- to assign speed, voltage... during operation,
- for configuration.

Table 2.1.4.1: Diagnostic LED

Description	Color	Function
M-	yellow	LED illuminated when the drive works in negative torque (anticlockwise rotation or braking in clockwise direction). Only for DCVN104
M+	yellow	LED illuminated when the drive works in positive torque (clockwise rotation or braking in anticlockwise direction). Braking only for DCVN104
AL	red	LED illuminated: DC drive malfunction
EN	green	LED illuminated: the DC drive is operating
n = 0	yellow	LED illuminated: no speed signalling
I_{lim}	yellow	LED illuminated: the DC drive is working in current limitation mode

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2.1.5 Storage, transport

Receiving the DC drive

When unpacking the DC drive, verify that it has not been damaged during transport.

Verify that the reference of the DC drive written on the label matches the shipping note.

For DC drives from products M14● to M30● the label bearing the DC drive reference is found on the independent power bridge.

It is always recommended to transport and store DC drives in horizontal position.

If the product is damaged, or if the delivery is incomplete or incorrect, please notify our service representatives immediately.

Storage
DC drives can only be stored in a dry place, in their original packaging, and in observance of the indicated temperature range.

Note! The rooms, tables, or cabinets, where the DC drives are installed should be designed in such a way as to avoid any risk of condensation.

2.2 Selection guide

2.2.1 DC drive choice

Choice of DC drive essentially depends on:

- the rated armature voltage of the motor and the network voltage
- the optimized armature current which should not exceed the permanent optimized current of the DC drive
- the excitation current, the motor, as well as its voltage

4-quadrant product line - Classe S: input voltage up to 3x500V± 10% / output voltage up to 520V - Classe Y: input voltage 3x690V± 10% / output voltage 720V

Table 2.2.1.1: 4-quadrant product line.

DCVN104●●●●	I induced permanent	I permanent line	I max excit	DC Drive
DCVN104D40S	40A	34A	10A	186W
DCVN104D70S	70A	60A	10A	254W
DCVN104C11S	110A	95A	14A	408W
DCVN104C18S	185A	160A	14A	553W
DCVN104C28S	280A	241A	20A	781W
DCVN104C42S	420A	361A	20A	1038W
DCVN104C65S	650A	559A	20A	1693W
DCVN104C77S	770A	662A	25A	2143W
DCVN104M11S	1050A	903A	25A	2590W
DCVN104M15S	1500A	1290A	70A	4900W
DCVN104M14Y	1400A	1205A	70A	4900W
DCVN104M20S	2000A	1720A	70A	5400W
DCVN104M20Y	2000A	1720A	70A	6800W
DCVN104M27S	2700A	2313A	70A	8700W
DCVN104M27Y	2700A	2313A	70A	8700W
DCVN104M30S	3000A	2580A	70A	9000W
DCVN104M30Y	3000A	2580A	70A	9000W

T2211-en

Note! Do not connect mains voltage to the outgoing terminals of DC drives!
Never disconnect the motor while the product is in use.

For standard applications or for new motors, an armature choke is not necessary. However, certain motor manufacturers recommend it and in this case, it should be inserted into the armature circuit of the motor.

Currents defined refer to continuous operation at an ambient temperature of 40°C.

2.2 Selection guide

2-quadrant product line- Classe S: input voltage up to 3x500V± 10% / output voltage up to 600V - Classe Y: input voltage 3x690V± 10% / output voltage 810V

Table 2.2.1.2: 2-quadrant product line.

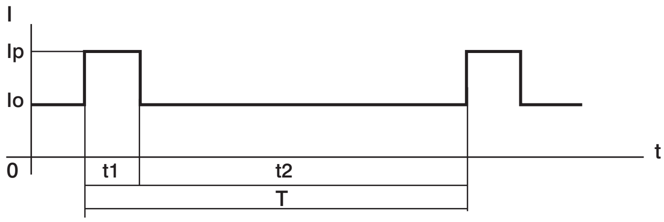
DCVN94●●●●	I induced permanent	I permanent line	I max excit	DC Drive
DCVN94D70S	70A	60A	10A	254W
DCVN94C11S	110A	95A	14A	408W
DCVN94C18S	185A	160A	14A	553W
DCVN94C28S	280A	241A	20A	781W
DCVN94C42S	420A	361A	20A	1038W
DCVN94C65S	650A	559A	20A	1693W
DCVN94C77S	770A	662A	25A	2143W
DCVN94M10S	1000A	860A	25A	2590W
DCVN94M15S	1500A	1290A	70A	4900W
DCVN94M14Y	1400A	1205A	70A	4900W
DCVN94M20S	2000A	1720A	70A	5400W
DCVN94M20Y	2000A	1720A	70A	6800W
DCVN94M27S	2700A	2313A	70A	8700W
DCVN94M27Y	2700A	2313A	70A	8700W
DCVN94M30S	3000A	2580A	70A	9000W
DCVN94M30Y	3000A	2580A	70A	9000W

T2212-en

2.2.2 Single cyclic load

Operation can be defined by two states: Io and Ip

Ip = peak current
Io= current in steady state



It is necessary to observe the following time limitations:
- t2 ≥ 7*t1
- t1 ≤ 15s for products D40S to C65S
- t1 ≤ 10s for products C77S to M30●

Table 2.2.2.1: Peak current and in steady state.

I induced permanent (A)	40	70	110	185	280	420	650	770	1000	1050	1400	1500	2000	2700	3000
Io (A)	22	34	50	125	175	260	425	520	520	520	750	750	1050	1620	1700
Ip (A)	54	96	154	231	350	525	780	900	1400	1485	2170	2325	3000 (1) 2740 (2)	3500 (1) 3600 (2)	3900

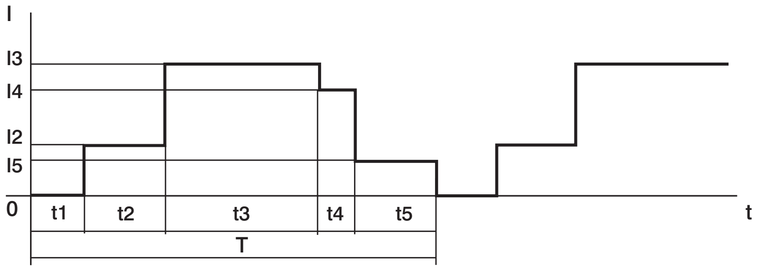
T2221-en

(1) DC drives DCVN104/94M2●●S
(2) DC drives DCVN104/94M2●●Y

2.2.3 Special cycle speed

For a particular and well-known operating cycle, it is necessary to calculate the average heat equivalent current Itei:

$$Itei = \sqrt{\frac{I_1^2 t_1 + I_2^2 t_2 + I_3^2 t_3 + \dots I_n^2 t_n}{T}} \quad \text{where } T = t_1 + t_2 + t_3 + \dots + t_n$$



$$Itei = \sqrt{\frac{I_2^2 t_2 + I_3^2 t_3 + I_4^2 t_4 + I_5^2 t_5}{T}}$$

This Itei current must be less than or equal to 0.8 of the permanent armature current
Furthermore it must be ensured that the peak load current is less than or equal to Ip

If an overload is necessary, the adjustment must be carried out according to the instructions given in Chapter 5.14.6 “Overload” in the operating manual

Note! The DC drive must be derated if it is installed at an altitude greater than 1000m just as for temperatures above those authorized (see «Authorized ambient conditions» chapter).

2.2.4 Power fuses

To provide adequate protection to the power semiconductors, suitable semiconductor fuses should be used.

The line and armature semi-conductor fuses are included in the DC drive from the C77S product: Refer to Chapter 7, “list of spare parts”.

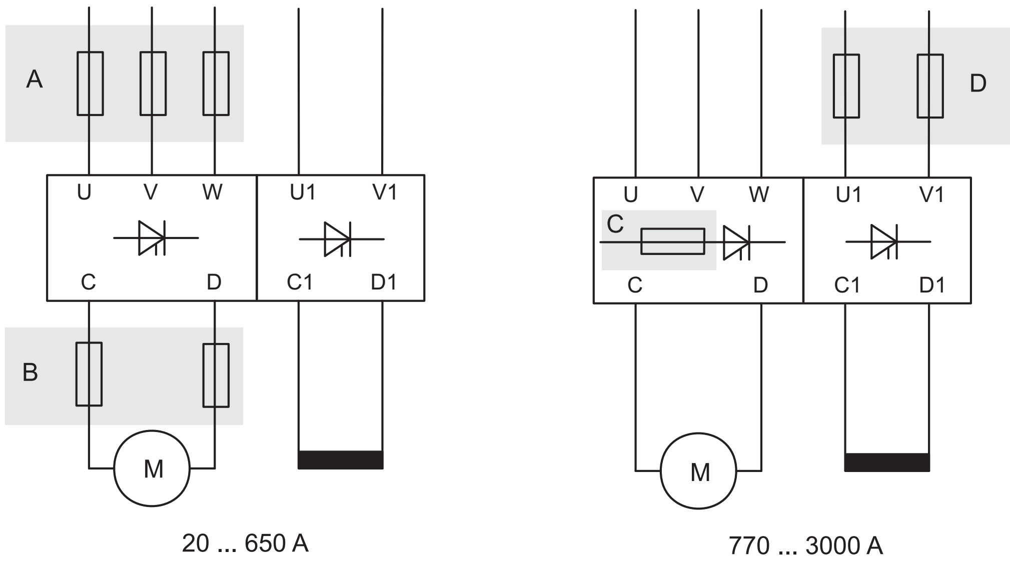


Figure 2.2.4.1: Assignment of semi-conductor fuses.

Connection fuses / DC drive

Table 2.2.4.1: Connection fuses / drive DCVN104••••

DCVN104●●●●	Line A fuses	Fuse holder	B Induced fuse	Fuse holder	D excitation fuse (1)	Fuse holder
DCVN104D40S	DCVF4M15 (1)	DF5FA61	DCVF4M17 (1)	DF5FA61	Integrated	-
DCVN104D70S	DCVF4M19 (1)	DF5FA61	DCVF4M21 (1)	DF5FA61	Integrated	-
DCVN104C11S	DCVF4M21 (1)	DF5FA61	DCVF4EAJ (2)	DCVS7B77	Integrated	-
DCVN104C18S	DCVF4G23 (2)	DCVS7B77	DCVF4G23 (2)	DCVS7B77	Integrated	-
DCVN104C28S	DCVF4G30	DCVS7B78	DCVF4G34	DCVS7B78	Integrated	-
DCVN104C42S	DCVF4E30	DCVS7B78	DCVF4E31	DCVS7B78	Integrated	-
DCVN104C65S	DCVF4G85	DCVS7B78	DCVF4G85	DCVS7B78	Integrated	-
DCVN104C77S	Integrated	-	Integrated	-	Integrated	-
DCVN104M11S	Integrated	-	Integrated	-	Integrated	-
DCVN104M15S	Integrated	-	Integrated	-	DCVF4M19	DF5FA61
DCVN104M14Y	Integrated	-	Integrated	-	DCVF4M19	DF5FA61
DCVN104M20S	Integrated	-	Integrated	-	DCVF4M19	DF5FA61
DCVN104M20Y	Integrated	-	Integrated	-	DCVF4M19	DF5FA61
DCVN104M27S	Integrated	-	Integrated	-	DCVF4M19	DF5FA61
DCVN104M27Y	Integrated	-	Integrated	-	DCVF4M19	DF5FA61
DCVN104M30S	Integrated	-	Integrated	-	DCVF4M19	DF5FA61
DCVN104M30Y	Integrated	-	Integrated	-	DCVF4M19	DF5FA61

T0290-104en

(1) fixed quality of 10 fuses.
(2) fixed quality of 3 fuses.

2.2 Selection guide

Table 2.2.4.2: Connection fuses / DC drive DCVN94••••

DCVN94●●●●	Line A fuses	Fuse holder	D excitation fuse (1)	Fuse holder
DCVN94D70S	DCVF4M19 (1)	DF5FA61	Integrated	-
DCVN94C11S	DCVF4M21 (1)	DF5FA61	Integrated	-
DCVN94C18S	DCVF4G23 (2)	DCVS7B77	Integrated	-
DCVN94C28S	DCVF4G30	DCVS7B78	Integrated	-
DCVN94C42S	DCVF4E30	DCVS7B78	Integrated	-
DCVN94C65S	DCVF4G85	DCVS7B78	Integrated	-
DCVN94C77S	Integrated	-	Integrated	-
DCVN94M10S	Integrated	-	Integrated	-
DCVN94M15S	Integrated	-	DCVF4M19	DF5FA61
DCVN94M14Y	Integrated	-	DCVF4M19	DF5FA61
DCVN94M20S	Integrated	-	DCVF4M19	DF5FA61
DCVN94M20Y	Integrated	-	DCVF4M19	DF5FA61
DCVN94M27S	Integrated	-	DCVF4M19	DF5FA61
DCVN94M27Y	Integrated	-	DCVF4M19	DF5FA61
DCVN94M30S	Integrated	-	DCVF4M19	DF5FA61
DCVN94M30Y	Integrated	-	DCVF4M19	DF5FA61

T0290-94en

(1) fixed quality of 10 fuses.
(2) fixed quality of 3 fuses.

Note! Invertors from the DCVN94●●● product line do not require armature fuses.
The fuse holders are not equipped with fuse blowout detection.

2.2.5 Input chokes

To limit interferences associated with harmonic currents generated by the thyristor bridges, it is recommended to install at the head of each thyristor a three-phase line choke in accordance with the table below:

Connection line armature / DC drive

Table 2.2.5.1: Connection line armature / DC drive .

DCVN●●	Line inductance	Characteristics	Dissipation
DCVN●D40S	LDCVD70	70A, 350µH	110W
DCVN●D70S	LDCVD70	70A, 350µH	110W
DCVN●C11S	LDCVC15	150A, 170µH	280W
DCVN●C18S	LDCVC25	250A, 100µH	350W
DCVN●C28S	LDCVC25	250A, 100µH	350W
DCVN●C42S	LDCVC53	530A, 45µH	670W
DCVN●C65S	LDCVC65	650A, 38µH	730W
DCVN●C77S	LDCVM10	1025A, 24µH	1300W
DCVN104M11S	LDCVM10	1025A, 24µH	1300W
DCVN94M10S	LDCVM10	1025A, 24µH	1300W
DCVN●M15S	LDCVM14	1435A, 16µH	1450W
DCVN●M14Y	LDCVM14	1435A, 16µH	1450W
DCVN●M20S	LDCVM24	2460A, 10µH	1860W
DCVN●M20Y	LDCVM24	2460A, 10µH	1860W
DCVN●M27S	LDCVM24	2460A, 10µH	1860W
DCVN●M27Y	LDCVM24	2460A, 10µH	1860W
DCVN●M30S	Contact Schneider Electric		
DCVN●M30Y			

T0295-inductance-en

2.2.6 Input circuit-breaker

The input circuit-breaker protects the DC drive and the motor against the effects of a sustained overload and maintains the thermal cycle of the motor, even if the control of the DC drive is cut. It also makes it possible to safely isolate the motor power circuit.

The magnetic setting of the input circuit breaker must be based on the peak current required by the machine, the heat setting referring to the rated induced current for the machine.

The line RMS current is determined from the induced current according to the following formula:

I_{line} = I armature x 0.82 x 1.05

Connection Line circuit-breaker / DC drive

Table 2.2.6.1: Connection Line circuit-breaker / DC drive.

DCVN●●	Merlin Gerin Line circuit breaker	Icu (kA)
DCVN●D40S	NS100N-TM40D	25
DCVN●D70S	NS100N-TM80D	25
DCVN●C11S	NS160N-TM125D	30
DCVN●C18S	NS250N-TM200D	30
DCVN●C28S	NS250N-TM250D	30
DCVN●C42S	NS400N-STR23SE	30
DCVN●C65S	NS630N-STR23SE	30
DCVN●C77S	NS800N-µLOGIC2.0	40
DCVN104M11S	NS1000N-µLOGIC2.0	40
DCVN94M10S	NS1000N-µLOGIC2.0	40
DCVN●M15S	NS1600N-µLOGIC2.0	40
DCVN●M14Y	NS1250H-µLOGIC2.0	42
DCVN●M20S	NS2000N-µLOGIC2.0	65
DCVN●M20Y	NS2000N-µLOGIC2.0	65
DCVN●M27S	NS2500N-µLOGIC2.0	65
DCVN●M27Y	NS2500N-µLOGIC2.0	65
DCVN●M30S	Contact Schneider Electric	65
DCVN●M30Y		65

Tab0296-circuit breaker-en

Note! When using a dual motor configuration each motor should be individually protected.
Icu refers to the rated power current of the DC drive.

2.2.7 Line contactor

The size of the contactors should be selected on the basis of the DC drive's rated current. Sizing must be done according to the heating current in cycle AC1.

Connection line contactor / DC drive

Table 2.2.7.1: connection line contactor / DC drive.

DCVN●●	Telemecanique Line contactor
DCVN●D40S	LC1D32●
DCVN●D70S	LC1D50●
DCVN●C11S	LC1D80●
DCVN●C18S	LC1D115●
DCVN●C28S	LC1F185●
DCVN●C42S	LC1F400●
DCVN●C65S	LC1F500●
DCVN●C77S	LC1F500●
DCVN104M11S	LC1F630●
DCVN94M10S	LC1F630●
DCVN●M15S	LC1F780●
DCVN●M14Y	LC1F780●
DCVN●M20S	LC1BP33●31
DCVN●M20Y	LC1BP33●31
DCVN●M27S	LC1BR33●31
DCVN●M27Y	LC1BR33●31
DCVN●M30S	Contact Schneider Electric
DCVN●M30Y	

Tab0297-circuit breaker-en

Plese select the contactor voltage code using the Telemecanique catalogue.

	AC 50/60Hz		direct current	
Volts	110	230	110	220
LC1D.. , LC1F..	F7	P7	FD	MD
LC1B...	F	P	FD	MD

Note! For the LC1F & LC1B contactors series select the coil filter in the Telemecanique catalogue.

2 - Presentation - General information

2.3 Features

2.3.1 Environmental conditions and regulations

General standards:	EN 61800-1, EN 50178
Environment:	According to IEC 68-2 part 2 and 3 (EN 60068-2-2, test Bd)
Insulation distances:	According to IEC 664, IEC 664 A; Air pollution degree 2
EMC immunity:	EN 61000-4-4 EMC immunity level 4 EN 61000-4-2 EMC immunity level 6 kV CD / 8kV AD
Vibrations:	EN 60068-2-6, test Fc
EMC Compatibility:	EN 61800-3 following the indications in the “Electromagnetic compatibility guide.”
Safety:	EN 50178
Degrees of protection :	According to EN 60529 DCVN●D40S to M11S IP20 DCVN●M14Y to M30● IP00 for power bridge
Altitude:	Up to 1000 meters above sea level; for higher altitudes, 1.2% low current per 100 m of additional altitude.
Admissible temperature (Ta):	Function Ta = 0... 55 °C Beyond 40 °C: 1.25 % low current per degree above 40 °C Storage Ta = -20 ... +55 °C Transport Ta = -20 ... +60 °C
Air humidity:	Function 5% to 85%, without condensation Storage 5% to 95% Transport 95%
Atmospheric pressure:	Operation from 86 kPa to 106 kPa Storage from 86 kPa to 106 kPa Transport from 70 kPa to 106 kPa
Recycling the DC drive:	DC drives of the DCVN range can be reprocessed as electronic waste according to the prevailing national regulation for reprocessing of electronic components. The plastic ventilation covers of the DC drives up to product 185 A are recyclable: The material used is >ABS+PC< «-FR».

2.3.2 Connection to the mains

Table 2.3.2.1: Powers supply voltage.

<table>
<tr><th>DC Drive</th><th>Power bridge
(terminals U/V/W)</th><th>Excitation circuit
(terminals U1/V1)</th><th>Control circuit
(terminals U2/V2)</th><th>Fan
(terminals U3/V3)</th></tr>
<tr><td>DCVN104/94●●●S</td><td>3 x 230 V +/- 10%
3 x 400 V* +/- 10%
3 x 440 V +/- 10%
3 x 460 V +/- 10%
3 x 480 V +/- 10%
3 x 500 V +/- 10%
50/60Hz +/-5%</td><td rowspan="2">1 x 230 V +/- 10%
1 x 400 V +/- 10%
1 x 460 V +/- 10%
50/60Hz +/-5%</td><td>DCVN●D40S to C18S:
1x115V -15%
to 230V+15%
50/60Hz +/-5%</td><td rowspan="2">DCVN●C77S to M30●***:
1 x 230 V +/- 10%
50/60Hz +/-5%</td></tr>
<tr><td>DCVN104/94M●●Y</td><td>3 x 230 V +/- 10%
3 x 400 V +/- 10%
3 x 440 V +/- 10%
3 x 460 V +/- 10%
3 x 480 V +/- 10%
3 x 500 V +/- 10%
3 x 690 V* +/- 10%
50/60Hz +/-5%</td><td>DCVN●C28S to M30●:
1x115V or 230V **
+/-15%
50/60Hz +/-5%</td></tr>
</table>

Tab 0030-f-en

* Factory settings
To use the DC drive on a 500V network, switch S 15 on the regulation board must be positioned as follows:

DCVN94/104...S / DCVNS4B21	S 15 .7 = ON	S 15 .8 = OFF
DCVN94/104M...Y / DCVNS4B22	S 15 .7 = OFF	S 15 .8 = ON

Note! The undervoltage threshold of the power unit can be preset using the parameter **Undervolt thr** (standard: 230 V).

** DC drives are delivered for a 230V power supply voltage for the control circuit
For 115V power for products C28S to M11S insert a jumper between the earth terminals SA- SB placed on the DC drive.

*** Internal power of the fan for lower products

Note! DC Drives above product C77S... have an earth current higher than 3.5 mA. The EN 50178 standards require fixed connections which cannot be disconnected.

2.3.3 Excitation circuit

The DC drives (or the DCVS5N44 spare control board) are delivered with a minimum excitation current setting:

1 Up to product M11S
10 A from product M14Y to product M30●

Through use of the toggle switch S 14 on the control board, it is possible to select the regulation of the excitation current closest to the value stated on the motor.

In order to avoid damaging the quality of the regulation, it is recommended to work within 10% of the motor field current requirement.

Table 2.3.3.1a: excitation current calibration limitations.

DC drives DCVN●D40S to M11S:

Switch ohms	168.5 ohm	333 ohm	182 ohm	36.4 ohm	845 ohm	1668 ohm			**equivalent resistance**
excitation gauge	**S14-1**	**S14-2**	**S14-3**	**S14-4**	**S14-5**	**S14-6**	**S14-7**	**S14-8**	
1.0 A (*)	OFF	OFF	OFF	OFF	OFF	ON			1668 ohm
2.0 A	OFF	OFF	OFF	OFF	ON	OFF			845 ohm
3.0 A	OFF	OFF	OFF	OFF	ON	ON			558.8 ohm
5.0 A	OFF	ON	OFF	OFF	OFF	OFF			333 ohm
10.0 A	ON	OFF	OFF	OFF	OFF	OFF	Not used		168.5 ohm
12.9 A	ON	OFF	OFF	OFF	ON	ON			129.2 ohm
17.2 A	OFF	ON	ON	OFF	ON	ON			97 ohm
20.0 A	ON	OFF	ON	OFF	OFF	ON			83 ohm
24.1 A	ON	ON	ON	OFF	OFF	OFF			69 ohm

DCV0032f-en

(*) Default value upon delivery.

In order to obtain a current regulation value that is different or finer than those presented in the table, use the following formula to calculate resistor $R_{LA\text{-}LB}$ to insert between the earth terminals LA and LB on the control board.
In this case, it is necessary to turn all the S14 switches OFF and to set the parameter **Nom Flux curr** to the value calculated with this formula.

$R_{LA\text{-}LB}$ (Ohms) = 1667 /Excitation current

Table 2.3.3.1b: excitation current calibration resistances.

DC drives DCVN●M14Y to M30●:

excitation gauge	**S14-1**	**S14-2**	**S14-3**	**S14-4**	**S14-5**	**S14-6**	**S14-7**	**S14-8**	**equivalent resistance**
10A (*)	ON	OFF	OFF	OFF	OFF	OFF			168.5 ohm
20A	ON	OFF	ON	OFF	OFF	ON	Not used		83 ohm
46A	OFF	OFF	OFF	ON	OFF	OFF			36.4 ohm
70A	ON	ON	ON	ON	OFF	OFF			23.9 ohm

DCV0062en

(*) Default value upon delivery.

$R_{LA\text{-}LB}$ (Ohms) = 3332 /Excitation current

2.3.4 Control circuit

115V/230V power of the control circuit (earth terminals U2 and V2) should be protected against short-circuits.

The line circuit breaker or fuses should be chosen on the basis of the short-circuit power current and starting current of the power board of the DC drive. The circuit breaker or fuses are chosen to protect the wiring and to avoid tripping due to the starting current.

Table 2.3.4.1: starting and rated control circuit current.

Type	Control circuit				
	Power	Nominal current absorbed		Starting current	
		115 V	230 V	115 V	230 V
DCVN●●●D40S ... DCVN●●●C18S	70 W	1 A	0.5 A	20 A	10 A
DCVN●●●C28S ... DCVN●●●M11S	110 W	1.2 A	0.7 A	15 A	7.5 A
DCVN●●●M15S ... DCVN●●●M30Y	70 W	1 A	0.5 A	20 A	10 A

T0315-en

For the control circuit power supply, it's better to use an isolation transformer.

2.3.5 Fans

Starting from product C77S, the fans should be powered by an independent 230V 50/60Hz circuit on the earth terminals U3 and V3 of the DC drive.
The table below indicates the currents absorbed by the fans for tuning the protection connected to them:

Table 2.3.5.1: Fans.

DCVN●●	Fan	
	Absorbed current (A)	Flow rate (m^3 /h)
DCVN● C77S	0.75	1050
DCVN104M11S	0.75	1050
DCVN94M10S	0.75	1050
DCVN●M15S	0.4	900
DCVN●M14Y	0.4	900
DCVN●M20S	0.4	900
DCVN●M20Y	0.6	1450
DCVN●M27S	1.3	2600
DCVN●M27Y	1.3	2600
DCVN●M30S	1.3	2600
DCVN●M30Y	1.3	2600

Tab0299-vent-en

Note! From product M14, the power bridge is fitted with a ventilation power failure contact available on earth terminals 31-32 of the power bridge.

2.3.6 Output voltages

The output voltages shown below take into account a grid undervoltage, within the limits of determined tolerances, as well as a voltage drop of the order of 4% due to the insertion of line armatures. It is the same as the recommended induced voltage for the connected motor.

Armature circuit

Table 2.3.6.1: Armature circuit output voltage

Grid voltage (terminals U/V/W)	**Output voltage U_{dAN} (terminals C/D)**	
	DCVN94●	**DCVN104●**
3 x 230 V ±15 %	260 V	240 V
3 x 400 V ±15 %	470 V	420 V
3 x 440 V ±10 %	530 V	460 V
3 x 460 V ±10 %	560 V	480 V
3 x 480 V ±10 %	580 V	500 V
3 x 500 V ±10 %	600 V	520 V
3 x 690 V ±10 %	810 V	720 V

T0070f-en

Excitation circuit

Table 2.3.6.2: Excitation circuit output voltage

Grid voltage (terminals U1/V1)	**Output voltage U_{dFN}** (terminals C1 / D1)**	
	fixed excitation	**variable excitation**
1 x 230 V ±10 %	200 V *	200 V *
1 x 400 V ±10 %	310 V *	310 V *
1 x 460 V ±10%	360 V	360 V

T0080-f-en

* Voltage measured in accordance with DIN 40 030 (09/93)

** The max excitation voltage is 0.85 x U_{LN}

2.3.7 Control and regulation features

Digital inputs		0 / 15...30 V	3,2...6,4 mA (approx. 5 mA under 24V)
Digital outputs	Power	+ 15...35 V	
	Signal	+ 15...35 V	20 mA max per output
Analog inputs		0... ± 10 V	0,25 mA max
		0...20 mA	10 V max
		4...20 mA	10 V max
Analog outputs		0...± 10 V	5 mA max per output

Outputs on relays	Relay R1 (earth terminals 35-36)	250V	1A - AC11
	Relay R2 (earth terminals 75-76)	250V	1A - AC11
	Fusion fuses (earth terminals 81-82) *	250V	1A - AC11
	Ventilation failure (earth terminals 31-32) **	250V	1A - AC11

* C77S and beyond
** M14Y and beyond

Input PTC

On earth terminals 78 and 79 it is possible to connect a PTC probe or thermoswitch to detect the motor overheating.
When there is no temperature sensor, connect an external resistance to these earth terminals (R = 1 Kohm).

Connection of temperature probe:
Probes (PTC)
PTC probes to DIN 44081 or 44082 adapted to the motor can be connected directly to the DC drive via earth terminals 78 and 79. In this case, the 1 K ohm resistance mounted between earth terminals 78 and 79 must be removed.
Thermoswitches (Klixons) in the motor windings
"Klixon" thermoswitches can lock the DC drive as any other external fault could (terminal 15). The sensor can also be connected to earth terminals 78 and 79 to give a specific fault signal. In this case the 1 K ohm resistance of these earth terminals must be removed and connected in series to the Klixon circuit.

Encoder inputs

Sinusoidal	voltage	1 V pp
	load	8,3 mA pp per channel (input resistance= 124 Ohm)
	channels	two channels
	pulses per revolution	min: 600 - max:9999
	max. frequency	150 kHz
	max length of shielded cable	150 m (0,75 mm^2)/125 m (0.5 mm^2)/ 55 m (0.22 mm^2)
Incremental	voltage	5 V TTL / 15...24 V HTL (H logic)
	load	4,5 mA TTL / 6,8 ... 10,9 mA HTL
	channels	two channels with additional outputs
	pulses per revolution	min: 600 - max: 9999
	max. frequency	150 kHz
	max shielded cable	150 m (0.75 mm^2)/125 m (0.5 mm^2)/ 55 m (0.22 mm^2)

2.3 Features

Tachogenerator Input

voltage U_{dt}	22.7 / 45.4 / 90.7 / 181.6 / 302.9 V max depending on position of switch S4
load	8 mA full scale
max length of twisted shielded cable	depending on installation. 150 m typical

U_{dt} to V max	S4-1	S4-2	S4-3	S4-4
	S4-8	**S4-7**	**S4-6**	**S4-5**
22.7	ON	ON	ON	ON
45.4	ON	ON	ON	OFF
90.7	ON	ON	OFF	OFF
181.6	ON	OFF	OFF	OFF
302.9	OFF	OFF	OFF	OFF

DCV0033f-en

Internal voltages

Max load	+ 5 V	160 mA	connector XE1 PIN 7/9
	+ 10 V	10 mA	terminal 7
	- 10 V	10 mA	terminal 8
	+ 24 V	200 mA	connector XE2 PIN 2/9
Tolerance	+ 10 V	± 3 %	
	- 10 V	± 3 %	
	+ 24 V	+ 20 ... 30 V,	non stabilised

2.3.8 Accuracy

Internal reference voltage (± 10V, earth terminals 7,8):

Stability error based on temperature		100 ppm/°C

References:

by keyboard/Series link/bus		
	resolution:	16 Bit (15 Bit + sign)
by terminals (1/2, 3/4, 5/6)		
	resolution:	11 Bit + sign
	linearity	± 0.1% of full scale value

Analog Outputs

	resolution:	11 Bit + sign
	linearity:	± 0.5% of full scale value

Speed regulation

for all operation modes		
	maximum speed	8000 rpm
	digital resolution	0.25 rpm
	analog resolution	≥ 0.25 rpm
by sinusoidal encoder		
	speed feedback resolution	0.25 rpm
	usual accuracy	0.01%
	control scale	better than 1:10000
by incremental encoder		
	speed feedback resolution	0.5 rpm
	usual accuracy	0.02%
	control scale	better than 1:1000
by tachogenerator		
	Speed feedback resolution	better than 1:2000
	usual accuracy	0.1%
	control scale	better than 1:1000

Torque Regulation

	resolution	better than 1:2000
	usual accuracy	0.2%
	control scale	better than 1:500

2.3 Features

Note:

3.1 Simplified sequence diagram

Stop Category 0 per IEC/EN60204-1

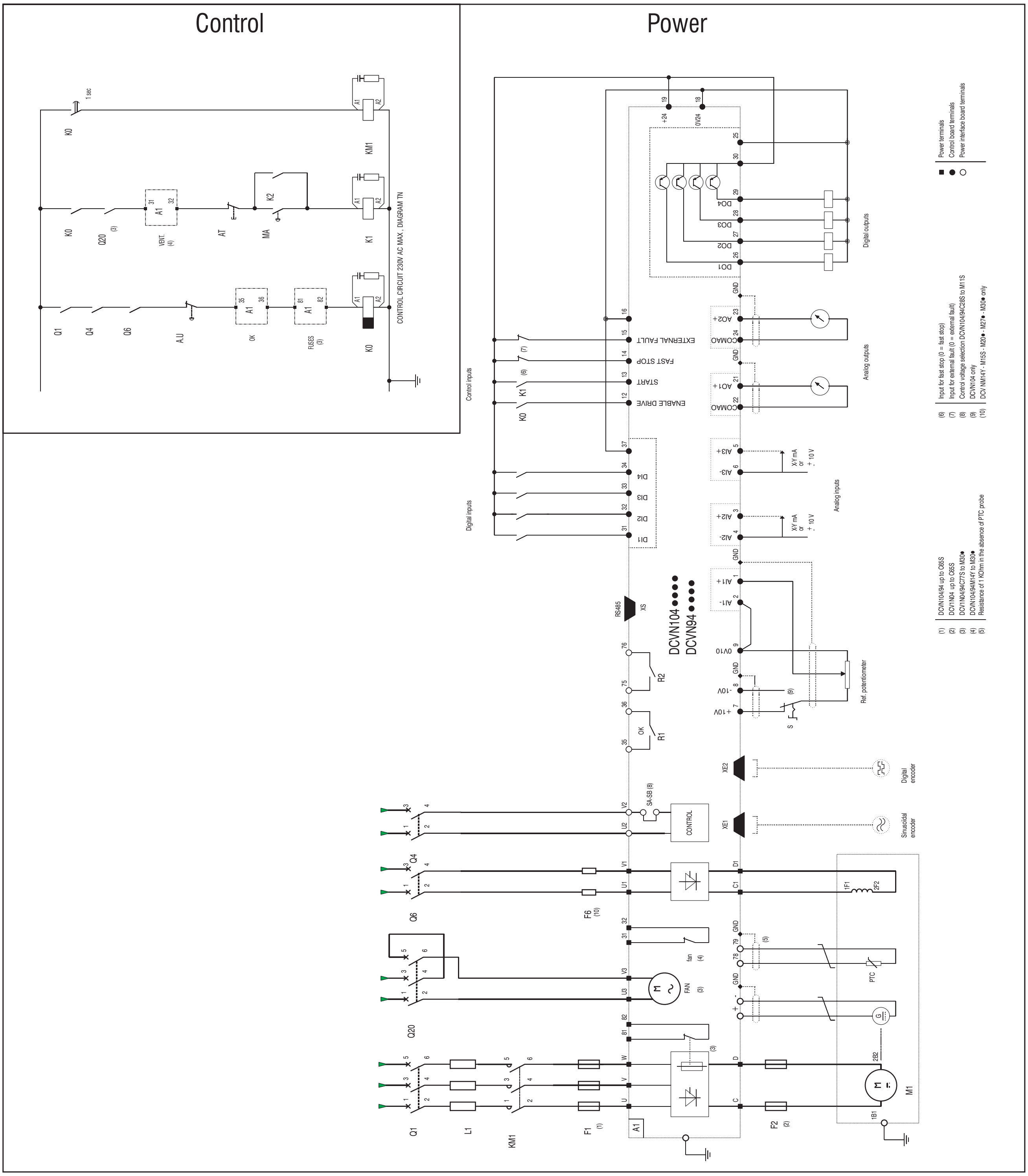


Figure 3.1.1: Typical control circuit and connection diagram.

3 - Installation

3.1 Simplified sequence diagram

Speed feedback inputs

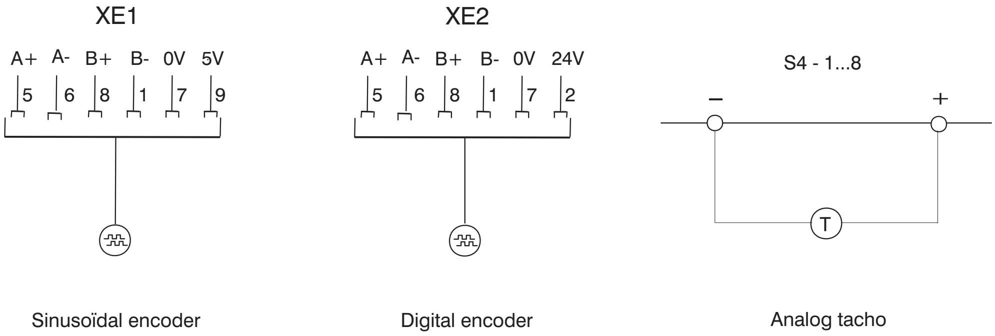


Figure 3.1.2: Encoder and tachogenerator connection.

List of necessary equipment

Table 3.1.1: List of necessary equipment.

F1, F2, F6	To be chosen from the associated table		Chapter 2.2.4
L1	-d°-		Chapter 2.2.5
Q1	-d°-		Chapter 2.2.6
KM1	-d°-		Chapter 2.2.7
Q4	Merlin Gerin Circuit Breaker *	Type for 115V power supply:	Type for 230V power supply:
DC Drives	D40S to C18S M14Y to M30●	C60N bi 1A curve D	C60N bi 0.5A curve D
	C28S to M11S	C60N bi 2A curve C	C60N bi 1A curve D
Q6	Merlin Gerin Circuit Breaker *		Type for 400V power supply:
DC Drives	D40S and D70S		C60N bi 10A curve C
	C11S to C18S		C60N bi 16A curve C
	C28S to C65S		C60N bi 20A curve C
	C77S to M11S		C60N bi 25A curve C
	M14Y to M30●		C60N bi 63A curve C
Q20	Telemecanique Circuit Breaker **		Type:
	C77S to M11S M20Y		GV2ME05
	M14Y to M20S		GV2ME04
	M27●		GV2ME06
	M30●		GV2ME06
R	1KΩ mini between 0V10 and +10V or -10V		

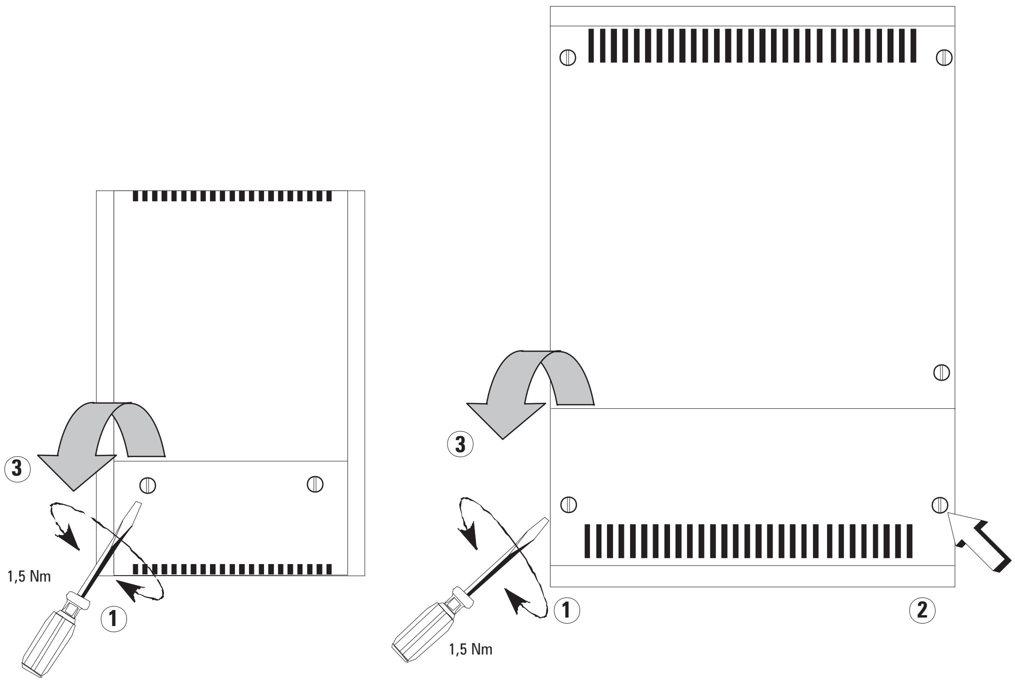
Tab 3.1_nomenclature

* 6KA interrupting capacity under 400V.
** Setting thermal release according to table in Chapter 2.3.5

3.2 Connections

3.2.1 Front cover removal

To make the electrical connections, the bottom front cover of the unit must be removed.



To DCVN●●●D40S

of DCVN●●●C28S

Figure 3.2.1.1: cover removal.

To install optional boards or to configure the different switches, disconnect the display cable, then remove the upper cover.

3.2.2 Connection features

Note ! The choice of connection section depends on the type of conductor, the installation type, ambient temperature, voltage and current, etc.: Refer to cable manufacturers' catalogs.

Table 3.2.2.1: Allowable earth terminal connection section.

DCVN●●	Section allowed for connection (mm^2) to the terminals				
	U, V, W, C, D, and PE	U1, V1, C1, D1	U3,V3, 35-36, 75-76, 78,79	+/-, control terminal	81-82, 31-32, control terminal
DCVN●D40S	10				
DCVN●D70S	16				
DCVN●C11S	6...50				
DCVN●C18S	16…95				
DCVN●C28S					
DCVN●C42S	Cu10x16x0.8				
DCVN●C65S					
DCVN●C77S	Cu50x8 or 2xCu10x16x0.8	0.2 … 4	0.14 … 1.5	0.14 … 1.5 Without terminal end	0.75 … 1.5 Without terminal end
DCVN104M11S	Cu50x8				
DCVN94M10S	2xCu11x21x1				
DCVN●M15S	Connection to the 50 x 8 bar				
DCVN●M14Y					
DCVN●M20●					
DCVN●M27●	Connection to the 60 x 12 bar				
DCVN●M30●	Connection to the 70 x 10 bar	Connection to the 120 x 12 bar			

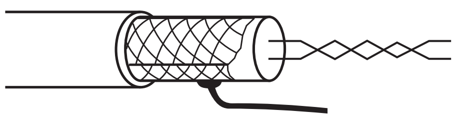
T0322-sections

Note! Connections must be retightened after a few days of operation, then checked annually.

3.2.2.1 Wiring

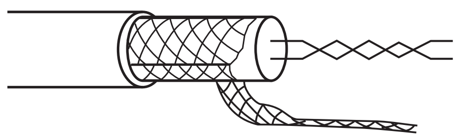
- Insulation: Except for the terminals identified for this use, do not connect any conductors connected to the terminal strips to the ground or the installation ground.
- The external analog and PTC probe circuits must be wired with stranded, shielded wire (not =< 5cm) . The same procedure is recommended for the tachogenerator feedback on + and - terminals. Separate the power cable and the control wires as much as possible.
- The low-level wire shields coming into the DC drive must be connected to the appropriate ground plan under the control board. The maximum length of links other than the reference and speed feedback is 5 m; Beyond that, implement an interface circuit.

Incorrect



wire soldered on braid

Correct



braid stretched directly up to the ground terminal, connected drive side only

- Equip all relays and contactors with voltage limiters (RC or diodes).

3.2.3 RS485 Serial Interface

3.2.3.1 Description

The RS 485 serial link allows the transmission of data via a loop made up of two stranded, symmetrical conductors with a common shield. For a transmission speed of 38.4 Kbauds, the maximum transmission distance is 1200 metres. Transmission is done through a differential signal. The RS 485 serial link is able to both transmit and receive in semi-duplex mode.
Through the RS 485 link it is possible to connect up to 31 DC drives (up to 128 addresses). Addressing is via the **Device address** parameter.
Refer to Chapter 8 (in the RS485 column) for details on associated parameters.

Point-to-point link
On DCVN●●● series DC drives, the RS485 serial interface is a 9-pole SUB-D (XS) connector located on the DCVS5N44 control board.
Communication may be achieved with or without galvanic insulation: With galvanic insulation, use external DCVS5Z40 power source.
The differential signal is transmitted on pins 3 (TxA/RxA) and 7 (TxB/RxB). The terminal resistors must be connected at the beginning and end of the physical connection of the RS 485 serial link to avoid signal reflection. On the control board, the terminal resistors are inserted by placing jumper straps S12 and S13.
This is only necessary for the first and last product connected on the link.
This configuration allows a point-to-point link with a programmable controller (PLC) or computer (PC).

Multi-point link
If a multi-point link is being considered, it is necessary to install a DCVS546Z adaptor onto each DC drive and to provide an external DCVS5Z40 power source.
Refer to documentation on these options to use them.

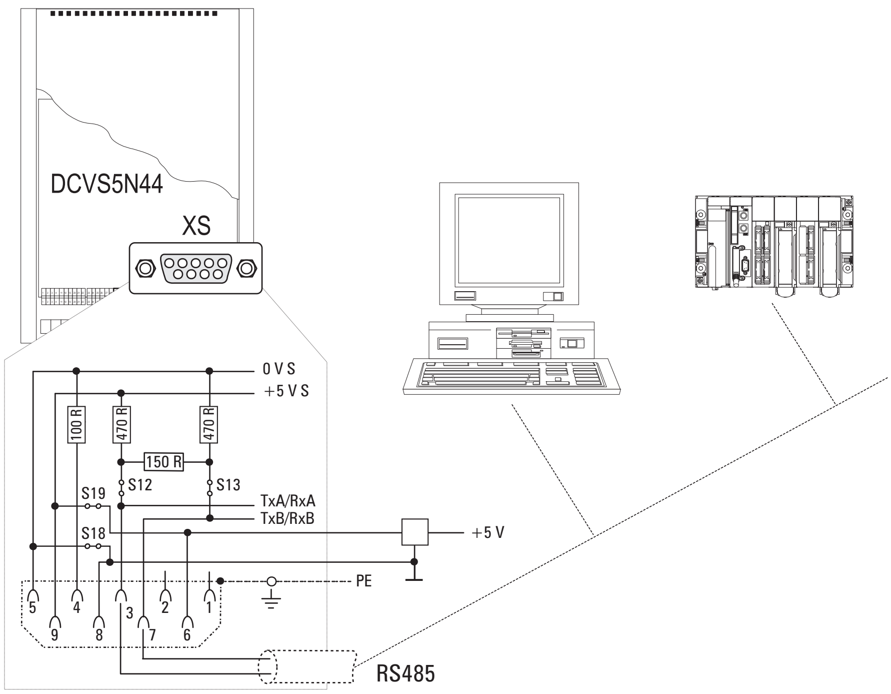


Figure 3.2.3.1.1: RS485 Serial Link

To connect a serial link:
- Use only shielded wires
- Separate shielded wires from power and control wires.

3.2.3.2 Connector

Table 3.2.3.2.1: XS connector pinouts for the RS485 serial link.

Description*	Function	I/O	Elect. interface
PIN 1	For internal use		
PIN 2	For internal use		
PIN 3	RxA/TxA	I/O	RS485
PIN 4	For internal use		
PIN 5	0 V (5V reference point)	I/O	Power supply
PIN 6	For internal use		
PIN 7	RxB/TxB	I/O	RS485
PIN 8	For internal use		
PIN 9	+5V	I/O	Power supply

I = Input, O = Output T0230f

* 9-pole connector assembled on the device.
A DIN 41 652 is required for connecting to the PLC or PC.

Control board jumpers S18 and S19 disconnect the serial link from the internal power supply provided by XS connector pins 5 and 9

S18 and S19 in the OFF position	The serial link is galavanically isolated from the controller part. Power to the serial link is supplied through pins 5 (0V) and 9 (+5V).
S18 and S19 in the ON position.	The serial link has the same ground potential as the control. Pins 5 and 9 supply power to the serial link adaptor. They cannot be used for any other function.

3.2.4 Installing the input - output extension option board

An optional DCVS5V62 board may be inserted into the DC drive control board. This board extends the number of analog outputs and digital inputs/outputs.

The optional DCVS5V62 board, inserted into the XBB connector, is considered to be option “B” by the DC drive.

Refer to information on this option to use it.

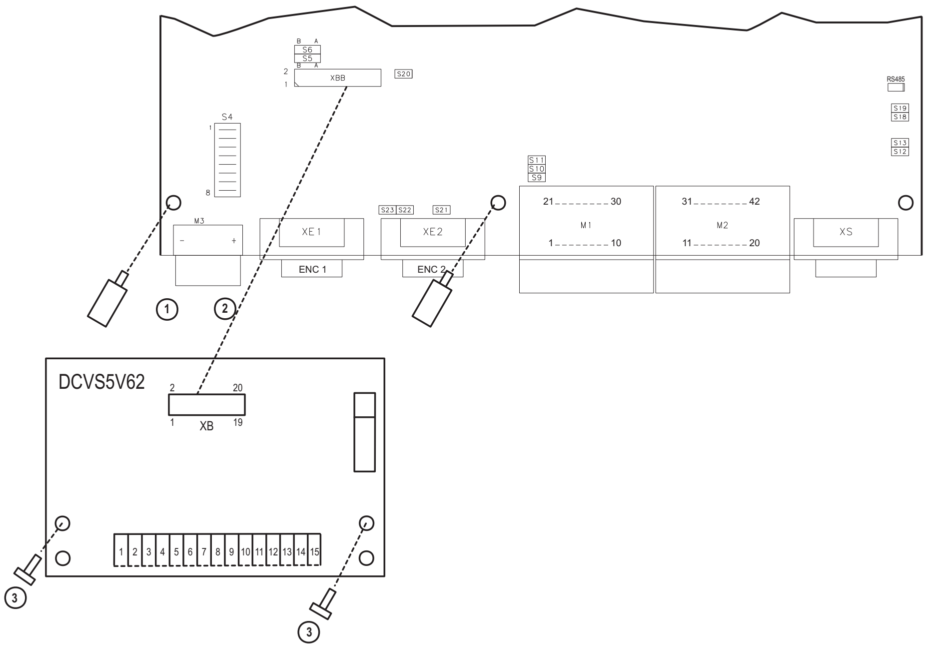


Figure 3.2.4.1: Installing an input-output extension board.

A flat 75 x 2.5 x 0.4 mm screwdriver is recommended. Strip the ends of the wires to 6.5 mm. Connect only one stripped wire on each terminal.

1 Loosen the existing screws and screw in spacers onto the hole thread
2 Attach optional board (the option’s XB connector into the XBB connector on the control board)
3 Using the screws, attach the option board onto the spacers.

3.3 DC drive installation

3.3.1 Installation Distances and Positions

Note! The weights and dimensions outlined in this guide must be taken into consideration when installing the DC drive. Appropriate technical equipment (cart or lifting product for heavy units) must be used. Incorrect handling or the use of inappropriate tools could damage the unit and even cause fatal injury.

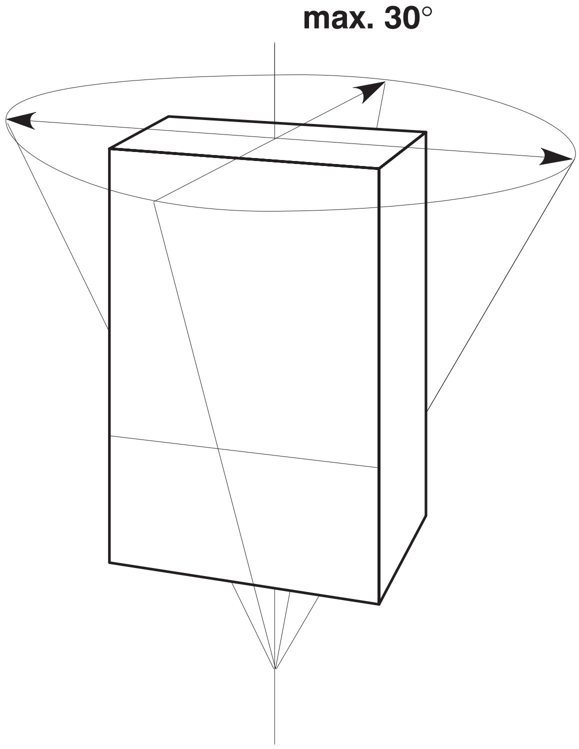


Figure 3.3.1.1: Maximum tilt angle.

- The maximum tilt angle is 30°.
- DC drives must be set up so that air may circulate freely around the unit.
- There must be at least 150 mm clearance around the DC drive.
  There must be at least 50 mm clearance for the front.
- Products that generate a great deal of heat must not be set up directly next to the DC drive.
- The power bridges of DC drives DCVNM14Y to M30● have a protection index of IP00. The user is responsible for taking the necessary measures (insulation protection, put into cabinet, etc.) to protect workers from the risk of direct or indirect contact with bare parts while powered on.

Note! Connections must be retightened after a few days of operation, then checked annually.

3.3 DC drive installation

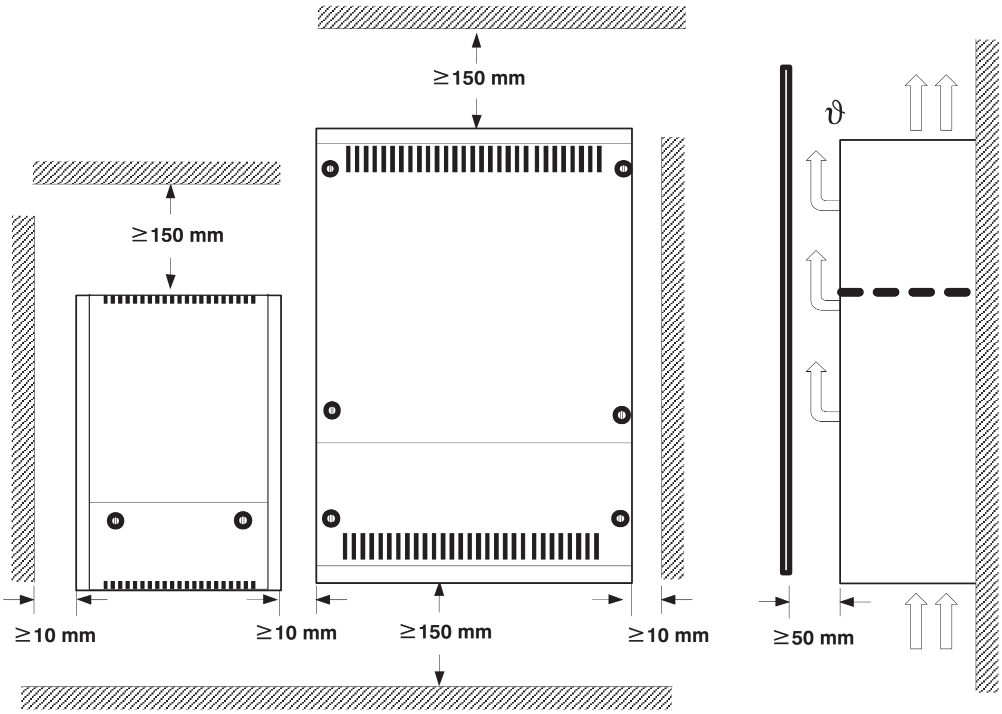
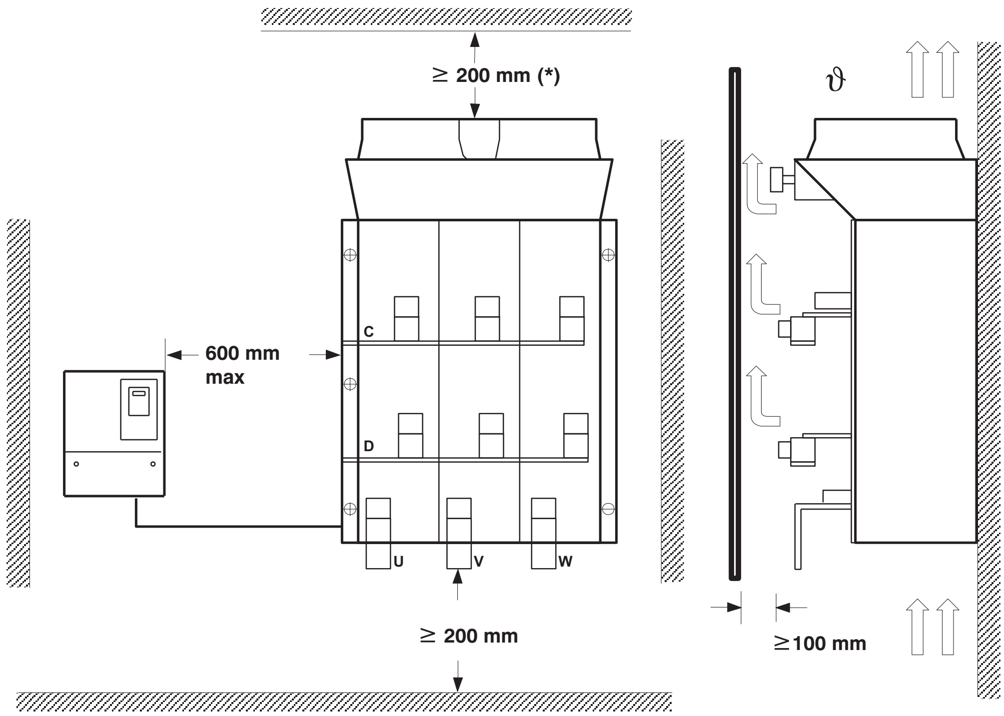


Figure 3.3.1.2: Installation Distances DCVN●D40S to M11S.



(*) = or better: Direct contact with opening made in the top of the cabinet.

Figure 3.3.1.2: Installation Distances DCVN●M14Y to M30.

3.3.2 Ventilation

When the DC Drive is mounted inside a cabinet, install ventilation grill for a better cooling process:

Table 3.3.2.1: ventilation.

DCVN●●	Ventilation Fan flow rate (m^3/h)	Grill surface area (mm^2)
DCVN●D40S	-	2 x 5100
DCVN●D70S	80	2 x 5100
DCVN●C11S	160	2 x 11300
DCVN●C18S	160	2 x 11300
DCVN●C28S	320	2 x 22600
DCVN●C42S	320	2 x 22600
DCVN●C65S	680	2 x 35400
DCVN●C77S	1050	2 x 53100
DCVN104M11S	1050	2 x 53100
DCVN94M10S	1050	2 x 53100
DCVN●M15S	900	2 x 53100
DCVN●M14Y	900	2 x 53100
DCVN●M20S	900	2 x 53100
DCVN●M20Y	1450	3 x 53100
DCVN●M27S	2600	2 x 160000
DCVN●M27Y	2600	2 x 160000
DCVN●M30S	2600	2 x 160000
DCVN●M30Y	2600	2 x 160000

Tab0332-ventilation-en

Note! Control Module DCVS4B●● refer to the product D70S.

3.3.3 Dimensions and weight

DC drives

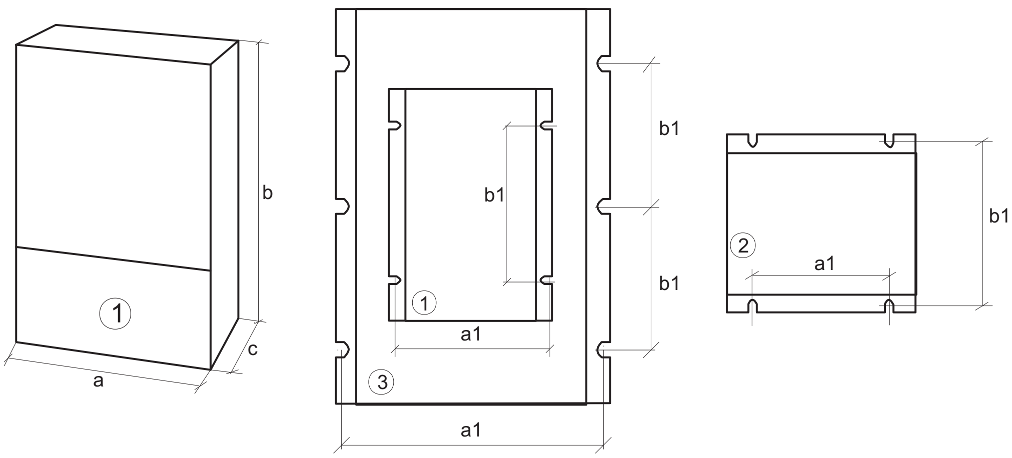


Figure 3.3.3.1: Sizes for products D40S.....to M11S.

Table 3.3.3.1: Sizes for products D40S.....to M11S.

Type	Size	a	b	c	a1	b1	dia.	Weight
		[mm]	[mm]	[mm]	[mm]	[mm]		[kg]
DCVN●D40S	1	266	360	280	250	275	M6	8.4
DCVN●D70S	1	266	360	280	250	275	M6	8.8
DCVN●C11S	1	266	360	280	250	275	M6	10.8
DCVN●C18S	1	266	360	280	250	275	M6	10.8
DCVN●C28S	2	311	388	343	275	375	M6	25.5
DCVN●C42S	2	311	388	343	275	375	M6	29.5
DCVN●C65S	2	311	388	373	275	375	M6	32
DCVN●C77S	3	521	512	410	500	200	M6	61
DCVN●M10S	3	521	512	410	500	200	M6	72
DCVN●M11S	3	521	512	410	500	200	M6	72

T0090A-f

Note! Control Module DCVS4B●● refer to the product D40S sizes

Table 3.3.3.2: Sizes for products M14Y.....to M30●.

Type	Size	a	b	c	d	e	f	a1	a2	d1	d2	Weight
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
DCVN94M14Y	4	500	760	275	550	153	95	10	480	50	225	70
DCVN94M15S	4	500	760	275	550	153	95	10	480	50	225	70
DCVN94M20S	4	500	760	275	550	153	95	10	480	50	225	70
DCVN94M20Y	4	620	764	360	550	233	95	10	600	50	225	100
DCVN94M27S	4	712	785	395	660	255	95	10	692	50	280	140
DCVN94M27Y	4	712	775	395	560	255	95	10	692	50	230	140
DCVN94M30S	4	784	960	415	680	237	150	10	764	50	290	205
DCVN94M30Y	4	784	960	415	680	237	150	10	764	50	290	205
DCVN104M14Y	4	500	1310	375	550	153	95	10	480	50	225	130
DCVN104M15S	4	500	1310	375	550	153	95	10	480	50	225	130
DCVN104M20S	4	500	1310	375	550	153	95	10	480	50	225	130
DCVN104M20Y	4	620	1314	475	550	233	95	10	600	50	225	170
DCVN104M27S	4	712	1535	490	660	255	100	10	692	50	280	240
DCVN104M27Y	4	712	1335	475	560	255	95	10	692	50	230	240
DCVN104M30S	4	784	1640	460	1360	237	150	10	764	50	290	330
DCVN104M30Y	4	784	1640	460	1360	237	150	10	764	50	290	330

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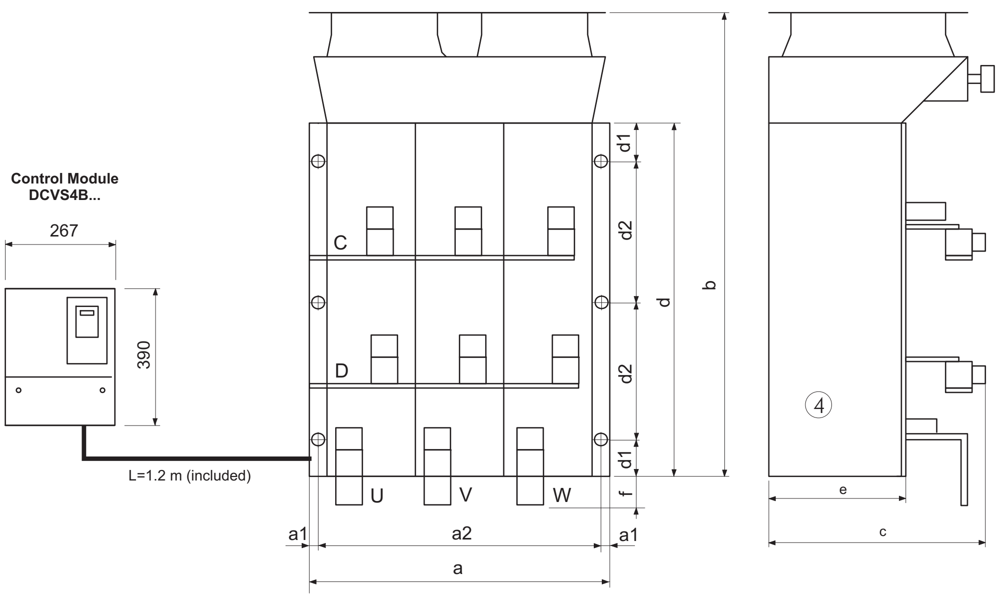
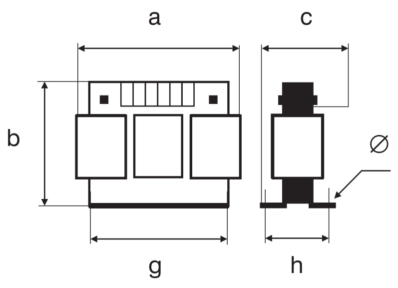
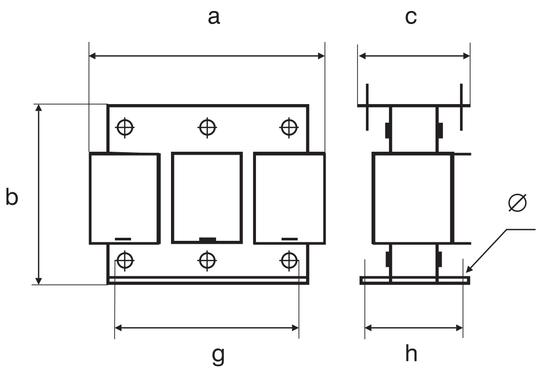


Figure 3.3.3.2: Sizes for products M14Y.....to M30●.

3.3 DC drive installation

Three-phase line chokes

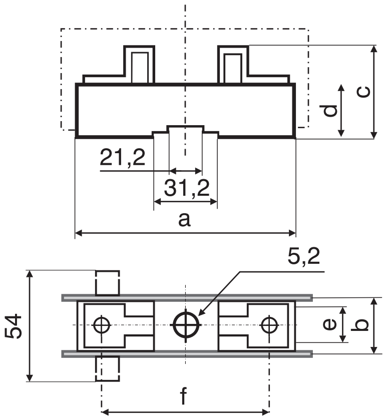




Reference	a mm	b mm	c mm	g mm	h mm	Ø mm	Weight Kg
LDCVD70	180	215	150	85	97	7	8,000
LDCVC15	270	240	150	105	96	11,5	14,900
LDCVC25	270	240	220	105	125	11,5	24,300
LDCVC53	380	410	225	315	95	9	37,000
LDCVC65	390	410	275	310	100	9	46,000
LDCVM10	400	410	310	310	125	9	66,000
LDCVM14	420	490	340	310	125	9	80,000
LDCVM24	420	550	385	310	155	9	120,000

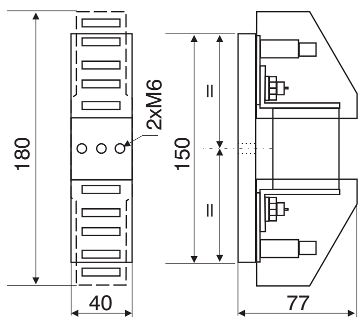
3.3 DC drive installation

Fuse holder

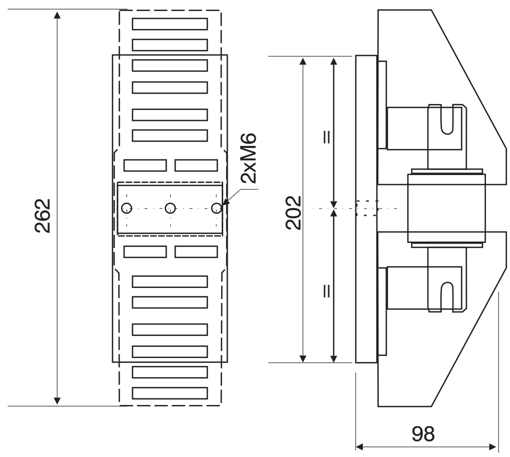


Reference	Size	a	b	c	d	e	f
DF5FA61	22-58	115	30	55	24	23	90

DCVS9B77

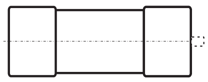


DCVS9B78

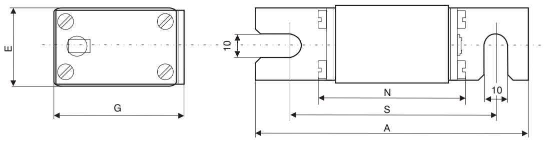


Fuses

3.3 DC drive installation

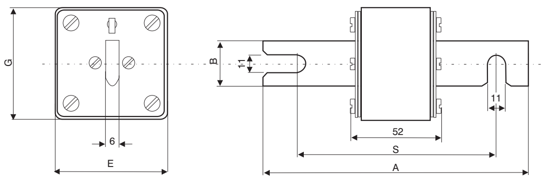


Cylindrical fuses



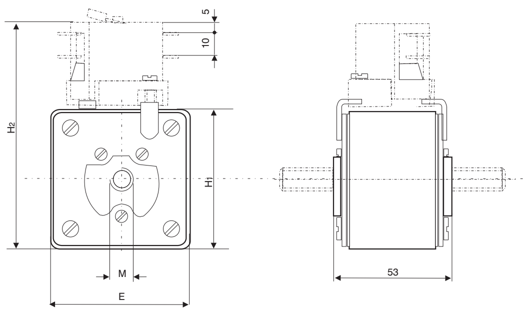
Type S

	A	E	G	N	S
DCVF4EAJ	105	27	47	54	80
DCVF4G23	105	30	51	56	80



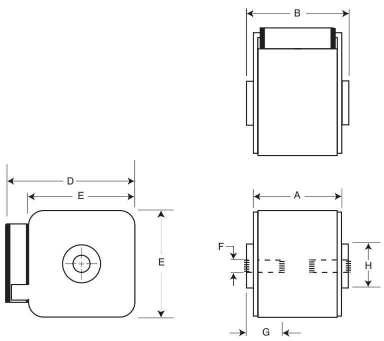
Type S1-S2

	A	B	E	G	S
S1	140	24	51	51	110
S2	140	30	60	60	110



Type G2M

	E	H1	H2	M	
G2M1	60	65	99	M10	



Type 170M

	A	B	D	E	F	G	H
170M5	50	51	69	53	M8	8	ø20
170M6	50	51	77	61	M10	10	ø24

Figure 3.3.3.3: Fuse Sizes

3.3 DC drive installation

Table 3.3.3.4: Associated fuses / fuse holder part references

DCVN●●●	Position (see Chap. 2.2.4)	Qty	Fuses: Reference	Fuses: Shape/Size	Fuses: Dimensions (mm)	Holder ref. fuses
DCVN104D40S	A	3	DCVF4M15	Cylindrical capsule	Ø 22.2x58	DF5FA61
	B	2	DCVF4M17	Cylindrical capsule	Ø 22.2x58	
	D	2	DCVS824B	Cylindrical capsule	Ø 6x32	(1)
DCVN●●● D70S	A	3	DCVF4M19	Cylindrical capsule	Ø 22.2x58	DF5FA61
	B (DCVN104)	2	DCVF4M21	Cylindrical capsule	Ø 22.2x58	
	D	2	DCVS824B	Cylindrical capsule	Ø 6x32	(1)
DCVN●●● C11S	A	3	DCVF4M21	Cylindrical capsule	Ø 22.2x58	DF5FA61
	B (DCVN104)	2	DCVF4EAJ	Type S	Fixing point = 80 mm	DCVS7B77
	D	2	DCVS824B	Cylindrical capsule	Ø 6x32	(1)
DCVN●●● C18S	A	3	DCVF4G23	Type S	Fixing point = 80 mm	DCVS7B77
	B (DCVN104)	2	DCVF4G23	Type S	Fixing point = 80 mm	
	D	2	DCVS824B	Cylindrical capsule	Ø 6x32	(1)
DCVN●●● C28S	A	3	DCVF4G30	Type S1	Fixing point = 110 mm	DCVS7B78
	B (DCVN104)	2	DCVF4G34	Type S1	Fixing point = 110 mm	
	D	2	DCVS823B	Cylindrical capsule	Ø 10x38	(1)
DCVN●●● C42S	A	3	DCVF4E30	Type S2	Fixing point = 110 mm	DCVS7B78
	B (DCVN104)	2	DCVF4E31	Type S2	Fixing point = 110 mm	
	D	2	DCVS823B	Cylindrical capsule	Ø 10x38	(1)
DCVN●●● C65S	A	3	DCVF4H01	Type S2	Fixing point = 110 mm	DCVS7B78
	B (DCVN104)	2	DCVF4H01	Type S2	Fixing point = 110 mm	
	D	2	DCVS823B	Cylindrical capsule	Ø 10x38	(1)
DCVN●●● C77S	C (DCVN94)	3	DCVF4G60	Type G2M		(1)
	C (DCVN104)	6	DCVF4G59	Type G2M		(1)
	D	2	DCVS823B	Cylindrical capsule	Ø 10x38	(1)
DCVN94M10S	C	3	DCVF4G61	Type G2M		(1)
	D	2	DCVS823B	Cylindrical capsule	Ø 10x38	(1)
DCVN104M11S	C	6	DCVF4G60	Type G2M	53x60	(1)
	D	2	DCVS823B	Cylindrical capsule	Ø 10x38	(1)
DCVN●●● M14Y	C (DCVN94)	6	DCVS7798	Type 170M6		(2)
	C (DCVN104)	6	DCVS7804	Type 170M6		(2)
	D	2	DCVF4M19	Cylindrical capsule	Ø 22.2x58	DF5FA61
DCVN●●● M15S	C (DCVN94)	6	DCVS7799	Type 170M6		(2)
	C (DCVN104)	6	DCVS7793	Type 170M5		(2)
	D	2	DCVF4M19	Cylindrical capsule	Ø 22.2x58	DF5FA61
DCVN●●● M20S	C	6	DCVS7802	Type 170M6		(2)
	D	2	DCVF4M19	Cylindrical capsule	Ø 22.2x58	DF5FA61
DCVN●●● M20Y	C (DCVN94)	6	DCVS7802	Type 170M6		(2)
	C (DCVN104)	12	DCVS7794	Type 170M6		(2)
	D	2	DCVF4M19	Cylindrical capsule	Ø 22.2x58	DF5FA61
DCVN●●● M27S	C	12	DCVS7797	Type 170M6		(2)
	D	2	DCVF4M19	Cylindrical capsule	Ø 22.2x58	DF5FA61
DCVN●●● M27Y	C (DCVN94)	12	DCVS7797	Type 170M6		(2)
	C (DCVN104)	12	DCVS7805	Type 170M6		(2)
	D	2	DCVF4M19	Cylindrical capsule	Ø 22.2x58	DF5FA61
DCVN●●● M30S	C	12	DCVS7799	Type 170M6		(2)
	D	2	DCVF4M19	Cylindrical capsule	Ø 22.2x58	DF5FA61
DCVN●●● M30Y	C (DCVN94)	12	DCVS7799	Type 170M6		(2)
	C (DCVN104)	12	DCVS7I93	Type 170M6		(2)
	D	2	DCVF4M19	Cylindrical capsule	Ø 22.2x58	DF5FA61

Tfuses-en

(1) DC drive-integrated.
(2) Power bridge-integrated.

3.3.4 Separated Control module

Figure 3.3.4.1: Position of terminals

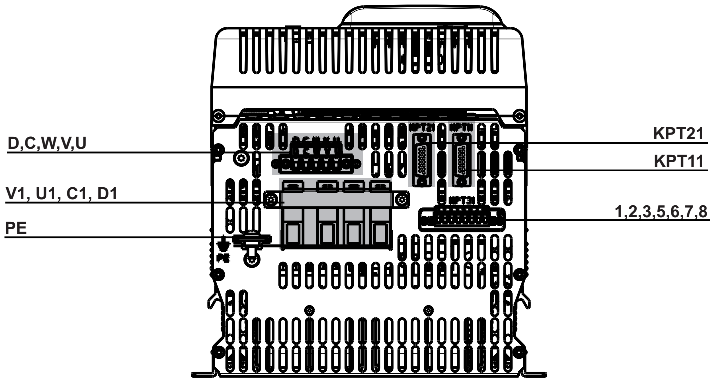


Table 3.3.4.1: Electrical data for all of the terminals and connectors listed

Connector	Terminal	Function	IN/OUT	Voltage	Current
-	U1, V1	Motor field circuit AC power input	IN	1 x 230 …460Aac, 50/60Hz	40 / 70Aac
	C1, D1	Motor field DC power output	OUT	0 …360Vdc	40 / 70Adc
KP	U, V, W	Mains voltage feedback	IN	3 x 230 …690Aac, 50/60Hz	200mA
	C, D	Armature voltage feedback	IN	0 …810Vdc	10mA
KPT31	1, 2, 3	Connection of bimetal thermostats	IN	-----	4mA
	5, 6, 7, 8	CT connection	IN	-----	0 …5Aac
KPT11, KPT21	15 poli Sub-D	Pulse transformer primary winding side circuits	OUT	-----	1A peak
XM	U2, V2	Regulation power supply	IN	1 x 115/230Aac, 50/60Hz	1/0,5Aac
	35, 36	Contact OK Relay	OUT	250Aac max	1A AC11
	75, 76	Relay 2 contact	OUT	250Aac max	1A AC11
	78, 79	Motor thermistor	IN	-----	-----
XCT	0VI, 0VI, RCT, RCT	Connection of external CT burden resistor	OUT	-----	5A max

3.3.4.1 Connection cables

All the control modules are supplied with three cables for connection to the power bridge in standard situations. However, additional cables may be necessary in certain conditions. These are described below.

Table 3.3.4.2.: Connection cables for DCVNS4DCU03 and DCVNS4DCU05

Name	Description	Supplied as standard	Code
KP Connector Interface Cable for DCVNS4DCU0..	Cable, 5-pin, AWG14, tot. length 2.5 m, sheathing for 1.5 m. Link between mains voltage and armature voltage. KP connector	yes	S72762
KPT31 Connector Interface Cable for DCVNS4DCU0..	Cable, 3 twisted pairs, 6-pin, AWG18, tot. length 2.5 m, sheathing for 1.5 m. Link between current sensors (CT) and thermal contact on power bridge(s). KPT31 connector	yes	S72763
KPT11 Connector Interface Cable for DCVNS4DCU0..	Cable, 10-pin, AWG22, tot. length 2.5 m, sheathing for 1.5 m. Link between pulse transformers. KPT11 15-pin D connector	yes	S72764
KP Connector Adapter Cable for DCVNS4DCU0..	Cable, 5-pin, AWG14, tot. length 0.3 m with sheathing. The cable is an adapter to allow a new DCVNS4DCU0.. control unit to be connected to replace an earlier version of the DCVS4B21 / DCVS4B22 control unit. For KP connector	upon request	S72760
KPT11 Connector Adapter Cable for DCVNS4DCU0..	Y-cable, 15-pin, AWG22, tot. length 0.3 m with sheathing. The cable is an adapter to allow a new DCVNS4DCU0.. control unit to be connected to replace an earlier version of the DCVS4B21 / DCVS4B22 control unit. Connector KPT11 and KPT31 on the DCVNS4DCU0..-.. side, KPT11 on the DCVN side	upon request	S72761

4 - Setup and commissioning

4.1 Positioning jumpers and micro-switches

Note! Before turning on the DC drive or control module, it is imperative that the configuration of jumpers and micro-switches be checked against the tables below.

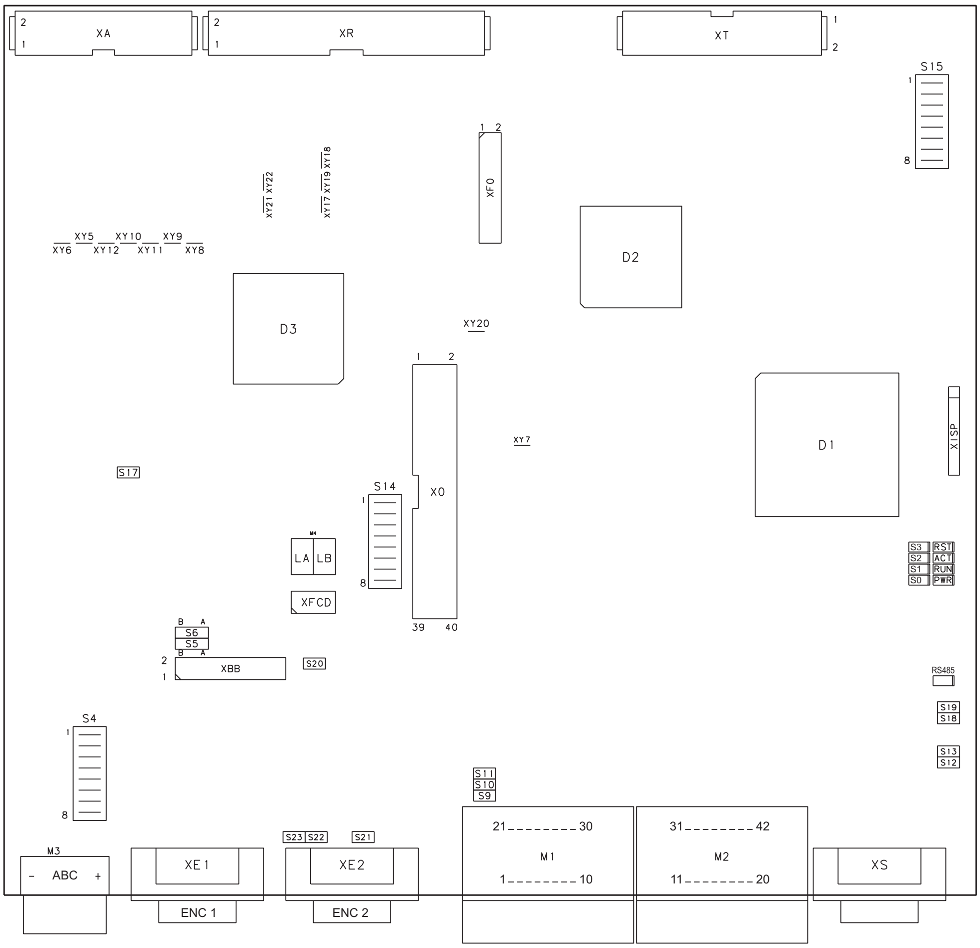


Figure 4.1.1: Topographical arrangement of control board components.

Note !

- Upon receiving a spare DCVS5N44 control board, the customisable S15 switches are set to 0. It is up to the user to configure the S15 according to the type and product of the DC drive, according to the tables set out below.

- Upon receiving a spare DCVS4B●● control module, the user must do the same with the S15 switch on the control board, but he must also configure S1, S3, S4 on the power interface board according to the product of the power bridge that is linked to it.

4.1 Positioning jumper straps and micro-switches

Table 4.1.1: customisable S15 switch for the type and product of the DC drive.

Converter type	S15-1	S15-2	S15-3	S15-4	S15-5	S15-6	S15-7(*)	S15-8
DCVN●D40S	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
DCVN●D70S	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
DCVN●C11S	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
DCVN●C18S	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
DCVN●C28S	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
DCVN●C42S	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
DCVN●C65S	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
DCVN●C77S	ON	ON	OFF	ON	OFF	OFF	OFF	OFF
DCVN94M10S	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
DCVN94M15S	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
DCVN94M20S	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF
DCVN94M27S	OFF	ON	ON	OFF	ON	OFF	OFF	OFF
DCVN94M30S	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF
DCVN94M14Y	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON
DCVN94M20Y	OFF	OFF	ON	OFF	ON	OFF	OFF	ON
DCVN94M27Y	OFF	ON	ON	OFF	ON	OFF	OFF	ON
DCVN94M30Y	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF
DCVN104M11S	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
DCVN104M15S	ON	ON	ON	ON	OFF	OFF	OFF	OFF
DCVN104M14Y	OFF	ON	ON	ON	OFF	OFF	OFF	ON
DCVN104M20S	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
DCVN104M20Y	ON	OFF	OFF	OFF	ON	OFF	OFF	ON
DCVN104M27S	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
DCVN104M27Y	ON	ON	OFF	OFF	ON	OFF	OFF	ON
DCVN104M30S	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
DCVN104M30Y	ON	OFF	ON	OFF	ON	OFF	OFF	OFF

T4110en

(*) The DCVN●●●S DC drives are delivered standard for a 400V armature thyristor bridge. For use on a 500V network, set S15-7 to “ON”.

Adjusting DT feedback voltage range

Depending on the maximum voltage which could be applied by the tachogenerator to the DC drive’s + and - earth terminals, the user might need to select the feedback voltage range by means of a resistor to be placed on earth terminals A, B, C of the DT feedback connector:

0...108V	No jumper strap between terminals A/B/C
108...188V	There are no jumpers between terminals B et C
188...340V	There are no jumpers between terminals A et C

Table 4.1.2: S4 switch adjusting the tachogenerator input voltage.

U_{dt} to V max	S4-1	S4-2	S4-3	S4-4
	S4-8	S4-7	S4-6	S4-5
22.7	ON	ON	ON	ON
45.4	ON	ON	ON	OFF
90.7	ON	ON	OFF	OFF
181.6	ON	OFF	OFF	OFF
302.9	OFF	OFF	OFF	OFF

DCV0033f-en

Table 4.1.3: Jumper straps on the control board.

Description	Function		Factory
S1	OFF= French, ON= English		
S4	Adaptation of the dynamo/tachogenerator feedback voltage see table 4.1.2		22.7V
S5,S6	Speed feedback type Sinusoidal encoder or digital Combination dynamo/tachometer Induced voltage	 Pos.A Pos.B Position immaterial	B
S9	Adaptation to the analogue 1 input (terminals 1 and 2) ON OFF	 0 ... 20 mA / 4 ... 20 mA 0 ... 10V / -10 ... +10V	OFF
S10	Adaptation to the analogue 2 input (terminals 3 and 4) ON OFF	 0 ... 20 mA / 4 ... 20 mA 0 ... 10V / -10 ... +10V	OFF
S11	Adaptation to the analogue 3 input (terminals 5 and 6) ON OFF	 0 ... 20 mA / 4 ... 20 mA 0 ... 10V / -10 ... +10V	OFF
S12 / S13	Resistance of terminator for the RS485 serial interface ON OFF	 Resistance of inserted terminator " " " not inserted	OFF
S14	Selection of maximum values for excitation current see table 4.1.4		
S15	Adaptation of the regulation board to the size of the drive see table 4.1.1		
S 18 / S 19	Selection of the internal/external power supply for the RS485 serial interface Pos. OFF Pos. ON	 Serial interface powered externally (PIN 5 and 9) and galvanically isolated from the regulation unit. Serial interface, powered internally and connected to the reference point of the regulation potential.	OFF
S20	Control of Channel C of the incremental encoder on connector XE2 ON OFF	 Channel C-controlled Channel C-uncontrolled	OFF
S21 / S22 / S23	Adaptation to the voltage of the output signals from the incremental encoder ON OFF	 5 V Encoder 15...30 V Encoder	OFF

T0160f-en

ON = jumper installed
OFF = jumper not installed

Table 4.1.4: Activating calibration jumper straps.

DC drives DCVN●D40S to M11S:

Switch ohms	168.5 ohm	333 ohm	182 ohm	36.4 ohm	845 ohm	1668 ohm			**equivalent resistance**
excitation gauge	**S14-1**	**S14-2**	**S14-3**	**S14-4**	**S14-5**	**S14-6**	**S14-7**	**S14-8**	
1.0 A (*)	OFF	OFF	OFF	OFF	OFF	ON			1668 ohm
2.0 A	OFF	OFF	OFF	OFF	ON	OFF			845 ohm
3.0 A	OFF	OFF	OFF	OFF	ON	ON			558.8 ohm
5.0 A	OFF	ON	OFF	OFF	OFF	OFF			333 ohm
10.0 A	ON	OFF	OFF	OFF	OFF	OFF	Not used		168.5 ohm
12.9 A	ON	OFF	OFF	OFF	ON	ON			129.2 ohm
17.2 A	OFF	ON	ON	OFF	ON	ON			97 ohm
20.0 A	ON	OFF	ON	OFF	OFF	ON			83 ohm
24.1 A	ON	ON	ON	OFF	OFF	OFF			69 ohm

DCV0032f-en

DC drives DCVN●M14Y to M30●:

excitation gauge	**S14-1**	**S14-2**	**S14-3**	**S14-4**	**S14-5**	**S14-6**	**S14-7**	**S14-8**	**equivalent resistance**
10A (*)	ON	OFF	OFF	OFF	OFF	OFF			168.5 ohm
20A	ON	OFF	ON	OFF	OFF	ON	Not used		83 ohm
46A	OFF	OFF	OFF	ON	OFF	OFF			36.4 ohm
70A	ON	ON	ON	ON	OFF	OFF			23.9 ohm

DCV0062en

(*) Default value upon delivery.

Table 4.1.5: Customising S1, J4, J5 jumpers and S4, S14, S15 switches to the type and product of power bridge (power interface board)

Drive Model	Jumper			Dip-switch																										
	S1	J4	J5	SW3-1	SW3-2	SW3-3	SW3-4	SW4-1	SW4-2	SW4-3	SW4-4	SW4-5	SW4-6	SW4-7	SW4-8	S14-1	S14-2	S14-3	S14-4	S14-5	S14-6	S14-7	S14-8	S15-1	S15-2	S15-3	S15-4	S15-5	S15-6	S15-7	S15-8
	Rated Armature Current															Default Excitation Current (10A)								Converter Type							
	On board FIR4P-53															On board R-TPD32-EV															
DCVN94M15S			ON					ON			ON	ON	ON			ON								ON				ON		ON	
DCVN94M20S			ON					ON		ON		ON	ON	ON		ON										ON		ON		ON	
DCVN94M27S			ON					ON	ON	ON		ON		ON	ON	ON									ON	ON		ON		ON	
DCVN94M30S			ON					ON			ON	ON	ON			ON											ON	ON		ON	
	On board FIR5P-63															On board R-TPD32-EV															
DCVN94M14Y			ON					ON			ON			ON		ON												ON			ON
DCVN94M20Y			ON					ON		ON		ON	ON	ON		ON										ON		ON			ON
DCVN94M27Y			ON					ON	ON	ON		ON		ON	ON	ON									ON	ON		ON			ON
DCVN94M30Y			ON					ON			ON	ON	ON			ON											ON	ON			
	On board FIR4P-53															On board R-TPD32-EV															
DCVN104M15S	ON		ON					ON			ON	ON	ON			ON								ON	ON	ON	ON			ON	
DCVN104M20S	ON		ON					ON		ON		ON	ON	ON		ON								ON				ON		ON	
DCVN104M27S	ON		ON					ON	ON	ON		ON		ON	ON	ON								ON	ON			ON		ON	
DCVN104M30S	ON		ON					ON			ON	ON	ON			ON								ON		ON		ON		ON	
	On board FIR5P-63															On board R-TPD32-EV															
DCVN104M14Y	ON		ON					ON			ON			ON		ON									ON	ON	ON				ON
DCVN104M20Y	ON		ON					ON		ON		ON	ON	ON		ON								ON				ON			ON
DCVN104M27Y	ON		ON					ON	ON	ON		ON		ON	ON	ON								ON	ON			ON			ON
DCVN104M30Y	ON		ON					ON			ON	ON	ON			ON								ON		ON		ON			

Important note !

When the FIR card is replaced, switches must be set according to the size of the converter.

To change Excitation nominal current value see chapter 2.3.3 .

Table 4.1.6: Selection of dip-switches “S3-XX” and “S4-XX” for FIR…cards

DCVN●●●	Dip-switch															
	S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	S3-7	S3-8	S4-1	S4-2	S4-3	S4-4	S4-5	S4-6	S4-7	S4-8
	On board FIR1-…															
DCVN●●● D40S				ON	ON	ON	ON									
DCVN●●● D70S	ON			ON			ON					ON				
DCVN●●● C11S				ON			ON					ON	ON			
DCVN●●● C18S				ON						ON		ON		ON		
	On board FIR2-X-…															
DCVN●●● C28S					ON					ON		ON		ON		
DCVN●●● C42S								ON		ON	ON				ON	
DCVN●●● C65S							ON	ON							ON	ON
	On board FIR3-32-…															
DCVN●●● C77S	ON									ON		ON				ON
DCVN●●● M10S		ON										ON	ON	ON		ON
DCVN●●● M11S	ON						ON								ON	ON

Important note !

When the FIR card is replaced, switches S3 and S4 must be set according to the size of the converter.

4.2 Earth Terminal Designation and Control Points

Table 4.2.1: LED's on control board.

Description	Function
PWR	Illuminated when the +5V is present and the correct value
RST	Illuminated when the RST signal is active
RS485	Illuminated when the RS485 interface is powered on
ACT	Illuminated when the thyristor control is activated
RUN	Warning lamp which flashes during the regulation phase

T0170f-en

Table 4.2.2: Test points on control board.

Test point	Function
XY17	Current signal induced (0.61 V = DC Drive nominal current)
XY18	0V reference

T0165f-en

21	22	23	24	25	26	27	28	29	30	31	32	33	34	37	38	39	40	41	42
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Figure 4.2.1: Positioning of earth terminals 1 to 42.

4.2 Earth Terminal Designation and Control Points

Table 4.2.3: Terminal assignments (terminals 1 to 20).

Terminal descriptions	Function		I/O	Voltage max	Current max
1 + 2 analog input 1	Programmable differential analog input Signal:terminal 1, reference point: terminal 2 Assigned in the factory to Ramp ref 1*		I	±10V	0.25mA (20mA in current setpoint)
3 + 4 analog input 2	Programmable differential analog input Signal:terminal 3, reference point: terminal 4 Not assigned in the factory*		I	±10V	0.25mA (20mA in current setpoint)
5 + 6 analog input 3	Programmable differential analog input Signal:terminal 5, reference point: terminal 6 Not assigned in the factory*		O	±10V	0.25mA (20mA in current setpoint)
7 +10V	Setpoint voltage +10V Reference point: terminal 9		O	+10V	10mA
8 -10V	Setpoint voltage -10V Reference point: terminal 9		O	-10V	10mA
9 0V 10	Reference point of voltages at terminals 7 and 8		—	—	—
10	Connection of shielding (PE), connected to the frame		—	—	—
11	0V internal		—	—	—
12 Enable drive	Validation of DC drive 0V +15...30V	 DC drive disabled DC drive enabled	I	+30V	15V/3.2mA 24V/5mA 30V/6.4mA
13 Start	Start command 0 V +15...30V	 No start Start	I	+30V	15V/3.2mA 24V/5mA 30V/6.4mA
14 Fast stop	Fast stop 0 V +15...30V	 Fast stop No fast stop	I	+30V	15V/3.2mA 24V/5mA 30V/6.4mA
15 External fault	External fault 0 V +15...30V	 Presence of an external fault No external fault	I	+30V	15V/3.2mA 24V/5mA 30V/6.4mA
16 COM ID	Reference point of discrete inputs, terminals 12 to 15		—	—	—
18 0V 24	Reference point of 24V voltage of terminal 19		—	—	—
19 +24 V	Voltage +24V Reference point: terminal 18		O	+20...30V	200 mA**
20	Connection of shielding (PE), connected to the frame		—	—	—

T0180f

* The user can adapt the configuration to the requirements of the application concerned via the keyboard, serial interface or bus link.
** Maximum available current, all loads included, on the internal +24V power supply

4.2 Earth Terminal Designation and Control Points

Table 4.2.4: Terminal assignments (terminals 21 to 42).

Description	Function	I/O	Voltage max.	Current max.
21	Analog output 1 Reference point: terminal 22 Factory preset value is: Actual speed	O	±10V	5mA
22	Reference point of analog output 1	—	—	—
23	Analog output 2 Reference point: terminal 24 Factory preset value is: Motor current	O	±10V	5mA
24	Reference point of analog output 2	—	—	—
25	Reference point of discrete outputs (terminals 26 to 29)	—	—	—
26	Digital output 1 Reference point: terminal 25 Assigned in the factory to Ramp +	O	+30V	20mA
27	Digital output 2 Reference point: terminal 25 Assigned in the factory to Ramp -	O	+30V	20mA
28	Digital output 3 Reference point: terminal 25 Assigned in the factory to speed threshold	O	+30V	20mA
29	Digital output 4 Reference point: terminal 25 Factory preset value is: Overload available	O	+30V	20mA
30	Power supply for discrete outputs	—	+30V	Depends on the load, 80mA max
31	Discrete input 1 Reference point: terminal 35 Not assigned in the factory	I	+30V	15V/3.2mA 24V/5mA 30V/6.4mA
32	Discrete input 2 Reference point: terminal 35 Not assigned in the factory	I	+30V	15V/3.2mA 24V/5mA 30V/6.4mA
33	Discrete input 3 Reference point: terminal 35 Not assigned in the factory	I	+30V	15V/3.2mA 24V/5mA 30V/6.4mA
34	Discrete input 4 Reference point: terminal 35 Not assigned in the factory	I	+30V	15V/3.2mA 24V/5mA 30V/6.4mA
35	Reference point of discrete inputs (terminals 31 to 34)	—	—	
36 ... 40	Not used			

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4.2 Earth Terminal Designation and Control Points

Note! Control board power.

The control board power is galavanically isolated from the power part. Figure 4.2.2 shows the principle:

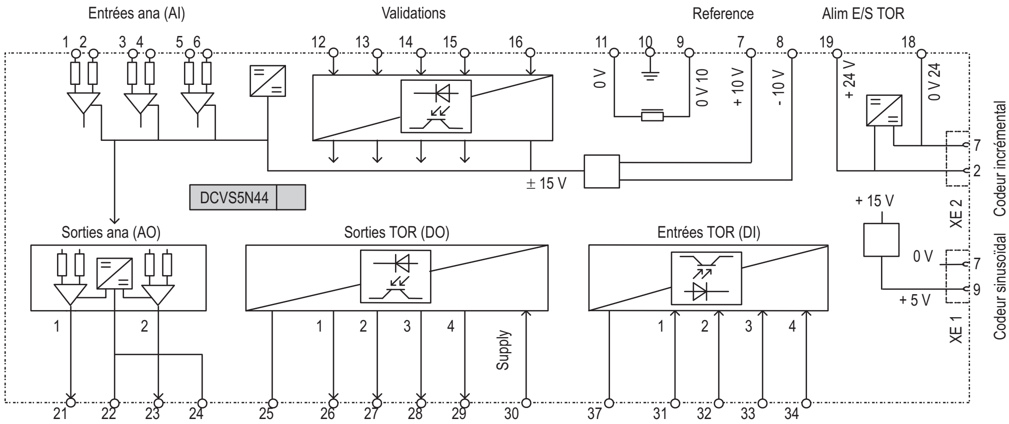


Figure 4.2.2: Potential of the regulation part.

- The analog inputs are differential.
- The digital inputs and outputs are separated from the regulator by optocouplers.
- Earth terminals 12..15 have terminal 16 as a reference potential.
- Earth terminals 31...34 have terminal 37 as a reference potential.
- Terminal 11 is connected to 0 V “electronic”, while terminal 10 is connected to the ground. In order to give better prevention against interference, it is possible to link terminal 10 to terminal 11 by means of a 0.1 μF capacitor.
- The power sources available on the regulation board have a common ground:
  +10V and - 10V for reference
  +24V digital input output supply
  +5V coding supply
- Analog outputs are separated by a differential amplifier. Both outputs have the same potential between them (earth terminals 22 and 24).
- To use the outputs, it is necessary to connect a power source voltage to terminal 30.

4.2 Earth Terminal Designation and Control Points

Table 4.2.5: Tachogenerator connecting block.

Description	Function	I/O	Max. voltage	Max. current
—	Reference point of tachogenerator input	-	—	—
+	Positive tachogenerator input Clockwise rotation: positive " anticlockwise negative	I	22.7 / 45.4 / 90.7 / 181.6 / 302.9 V *	1.8/3.6/6 mA

T0190f

* This depends on the selection imposed by switch S4 (see table 4.1.2)

Table 4.2.6: XE1 connector pinouts for a sinusoidal encoder.

Description	Function	I/O	Max. voltage	Max. current
PIN 1	Channel B-	I	1 V pp	8.3mA pp
PIN 2	Not used			
PIN 3	Channel C+(zero pulse)	I	1 V pp	8.3mA pp
PIN 4	Channel C-(zero pulse)	I	1 V pp	8.3mA pp
PIN 5	Channel A+	I	1 V pp	8.3mA pp
PIN 6	Channel A-	I	1 V pp	8.3mA pp
PIN 7	Reference point of the 5V	O		
PIN 8	Channel B+	I	1 V pp	8.3mA pp
PIN 9	Encoder supply voltage + 5V	O	+5 V	160mA

T0210f-en

Table 4.2.7: XE2 connector pinouts for an incremental coder.

Description	Function	I/O	Max. voltage	Max. current
PIN 1	Channel B-	I	30 V pp*	17mA pp
PIN 2	Encoder supply voltage +24V	O	24 V	200mA**
PIN 3	Channel C+ (zero pulse)	I	30 V pp*	17mA pp
PIN 4	Channel C- (zero pulse)	I	30 V pp*	17mA pp
PIN 5	Channel A+	I	30 V pp*	17mA pp
PIN 6	Channel A-	I	30 V pp*	17mA pp
PIN 7	Reference point of the 24V	O	—	—
PIN 8	Channel B+	I	30 V pp*	17mA pp
PIN 9	Not used	—	—	—

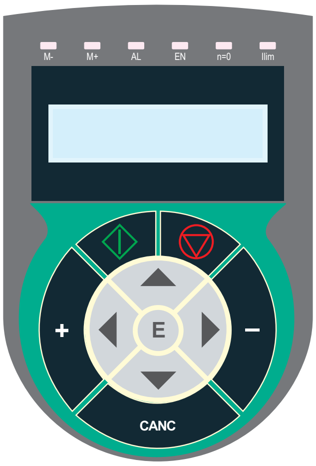
T0220f-en

* The maximum voltage is 30V when jumpers S21,S22,S23 are not installed (15..30V encoders).
If the jumpers are installed, the maximum voltage on these pins is 5V.

** Maximum available current, all loads included, on the internal +24V power supply

4.3 Control Keyboard

The control keyboard features an LCD display with two lines of 16 characters, with six LEDs and 10 function keys.



It is used:
- to control the DC drive if this command mode was selected
- to display speed, voltage, ... during operation
- setup of the DC drive.

4.3.1 LED Diodes

The keyboard's LED displays the operating mode that the DC drive is in.

Table 4.3.1.1: Diagnostic LED

Description	Color	Function
M-	yellow	LED illuminated when the drive works in negative torque (anticlockwise rotation or braking in clockwise direction). Only for DCVN104
M+	yellow	LED illuminated when the drive works in positive torque (clockwise rotation or braking in anticlockwise direction). Braking only for DCVN104
AL	red	LED illuminated: DC drive malfunction
EN	green	LED illuminated: the DC drive is operating
n = 0	yellow	LED illuminated: no speed signalling
I_{lim}	yellow	LED illuminated: the DC drive is working in current limitation mode

T0020f

4.3.2 Moving Between Menus

- The DRIVE STATUS menu always appears when the DC drive is turned on.
- Use the ▲ and ▼ keys to navigate between menus.
- Press ENT key to enter the selected menu or one of its submenus.
- Press CANC to return to the next higher level.

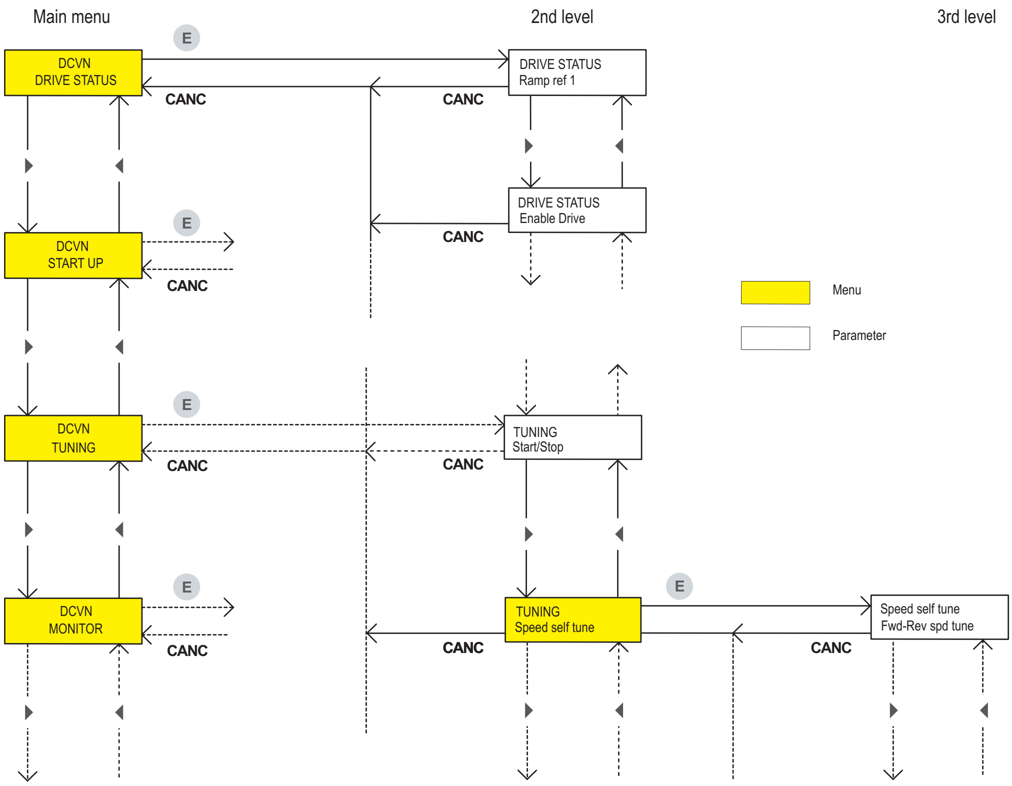


Figure 4.3.2.1 Moving between menus.

4.3.3 Viewing parameters

- Select the parameters within the menu.
- Press ENT. The parameter and its value will display.
- Return to the menu by using CANC.

4.3.4 Changing/ Validating parameters / Password

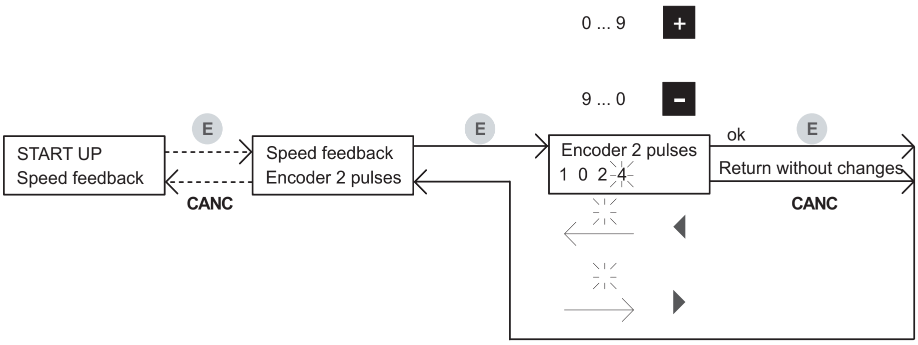
The parameters whose values can be changed fall into three groups:

- parameters whose content is inserted as a number or text in a defined range, e.g., ramp time and references
- parameters whose content is selected among pre-established values e.g. Jog selection with "Speed input" and "Ramp input" alternatives
- parameters which can be automatically defined by the keyboard, e.g. Auto tune inp XX.

Note! Only parameters not linked to a digital or analog input/output may be modified by the keyboard.

The modified parameters must be saved, otherwise the current parameters will be reloaded when the DC drive is turned on again.

Changing the numerical or text value:



- select the parameters to be changed within the Menu
- Press ENT. The parameter's value will be displayed and the last digit will flash. Each flashing number's value can be changed
- the + key to increase the value
- the - key to reduce the value
- select left digits by ◀
- select right digits by ▶
- ENT key: Return to preceding display and validation of new value
- CANC key: Return to preceding display without validating new value

Note! Selecting the **Dim factor text** parameter, in addition to numbers, the following characters / % & +,-.:<=>? A...Z [ ] a...z are available.

Selecting pre-defined values

- the parameters which can be chosen according to different possibilities are indicated on the keyboard display by the -/+ sign
- when the value has to be changed, press ENT. The display will indicate the current value, which can be changed using the + and - keys
- go back to the previous display and confirm the value by pressing ENT.
- go back to the previous display without confirming the value by pressing CANC.

Automatic analog input calibration

- Select the Auto tune input XX parameter
- press ENT
- the calibration process begins automatically. “Tuning” and “Ready” will appear in that order, followed the original parameter again.

Note! During the calibration process the maximum authorised signal should be present on the analog input.

Save

The modified parameters must be saved, otherwise the current parameters will be reloaded when the DC drive is turned on again.

- Select **Save Parameters** in the Basic Menu or SPEC FUNCTIONS Menu .
- Press ENT
- The save function is automatic. “Wait” then “Write ok” indicates that the save operation is complete.

Password Introduction

The operator may define a password made up of a any combination of five numbers, to protect data and avoid unwanted actions via the keyboard.
Use parameter **Pword 1**.

- Select **Pword1** (=Password 1) in the CONFIGURATION Menu to set up.
- Press ENT. 00000 will be displayed with the last digit flashing. The value of each flashing figure can then be changed.
- Confirm the password by pressing ENT. The message “Pword1: Enable” will display, with the value selected as password.
- In the CONFIGURATION menu, the message “Pword 1: Enabled” indicates that a password exists.
- Press the CANC key to stop entering the password.

Note! For the password to remain enabled when powered-up, it must be saved, using the **Save parameters** function.

Deleting the password

- Select the **Pword1** (=Password 1) parameter in the CONFIGURATION menu.
- When the password is enabled, the message “Pword 1:Enabled” will be displayed.
- Press ENT. The value 00000 will be displayed, and the last figure will flash.
  To delete the password, please enter the same combination of figures as the saved password.
- Confirm deletion by pressing ENT. The message: “Pword1:Disabled” will appear.
- Press the CANC key to end password deletion.
- When an incorrect password is entered by mistake, the message “Password wrong” will display as soon as the ENT key is pressed and the keyboard will return to the CONFIGURATION Menu and display “Pword1:Enabled”

Note! For a password not only to be disabled, but completely deleted, the new status must be memorised using the **Save Parameters** function.

4.3.5 Keyboard commands

To control the DC drive via the keyboard, the following parameters must be entered:

- **Main commands** Keyboard MENU START UP and CONFIGURATION
- **Control mode** Local MENU CONFIGURATION

- Control inputs to terminals 12 .. 15 must also be present when the DC drive is keyboard-controlled. This means, for example, that the signal to terminal 13 must be present even though it is effectively controlled via the keyboard.
- If the drive is stopped via the keyboard, it can be restarted by pressing the Run key.
- If the stoppage has been caused by a lack of signal to terminal 13, the signal to terminal 13 and the keyboard command are both required for the drive to restart. The signal to the terminals must be present before giving the command via the keyboard.
- The same principle applies to validating the DC drive using the **Enable drive** parameter.

4.3.5.1 Starting and stopping the DC drive

DC drive release

- Select the **Enable drive** parameter on the BASIC MENU or on the MONITOR menu
- Press ENT
- Use the + key to change the display from “Disabled” to “Enabled”
- Press ENT to confirm input.

Disabling the DC drive

- Select the **Enable drive** parameter on the STARTUP menu or on the MONITOR menu
- Press ENT
- Use the - key to change the display from “Enabled” to “Disabled”
- Press ENT to confirm input.

Start / Stop

This keyboard command can only be used when the **Main commands** parameter = Digital.

- To start: press RUN.
- To stop: press STOP.

4.3.5.2 Fault register/ RAZ

Displaying the fault register

- Select the **Failure register** parameter on the SPEC FUNCTIONS menu
- Press ENT. The last fault to occur is displayed
- The previous fault can be displayed using the + key
- The fault register can contain up to 10 messages. When a new fault occurs, the oldest one is deleted
- If the ENT key is pressed, the time of the fault is displayed. The time refers to the time that the drive has been working (connected to a power source)
- Pressing the CANC key returns to the **Failure register** menu.

Clearing the fault register

- Select the **Failure reg del** parameter on the SPEC FUNCTIONS menu
- Press ENT. The failure register is cleared.

Acknowledging a fault signal

- If a fault occurs, the display will flash
- Pressing the CANC key will allow acknowledgement of the failure, unless a Start command has been given.

Acknowledgement of several simultaneous faults

- If several faults are detected simultaneously, the words “Multi failures” will flash in the display
- Select the **Failure reset** parameter on the SPEC FUNCTIONS menu
- Pressing the ENT key will allow acknowledgement of the faults, unless a Start command has been given.

4.3.5.3 Motorised potentiometer function

Note! To use the motorised potentiometer function, it must be activated using the **Enable moto pot** (Enabled) parameter

Acceleration, deceleration

- Select the **Motor pot oper** parameter on the “Motor pot” sub-menu
- By pressing ENT, the current reference value will be displayed
- Pressing the + key will increase the reference value and speed
- Pressing the - key will decrease the reference value and the motor will slow down. This is valid for rotation in either direction
- Pressing CANC will return to the “Motor pot” sub-menu”.

Inverting the direction of rotation

- Select the **Motor pot sign** parameter on the “Motor pot” sub-menu
- By pressing ENT, the current direction of rotation will be displayed
- Pressing the + key will select clockwise rotation and the - key selects anti-clockwise (anti-clockwise rotation only on the DCVN104)
- Confirm choice by pressing ENT.
- Changing the parameter **Motor pot sign** while the machine is working will invert the direction of rotation in accordance with the ramp times selected.

Motorised motor-potentiometer reset

- Select the **Motor pot reset** parameter on the “Motor pot” sub-menu
- Press ENT. The speed reference is set to zero.

Note! Setting the speed reference to zero is only possible with the DC drive disabled.

4.3.5.4 Jog Function

Note! The Jog function must be activated using the **Enable jog** (Enabled) parameter.

- Select the **Jog operation** parameter on the “Jog function” sub-menu
- Press the ENT key. The Jog function selection is displayed
- Pressing the + key will select clockwise rotation and the - key selects anti-clockwise (anti-clockwise rotation only on the DCVN104)
- Pressing CANC will return to the “Jog function” sub-menu”.

4.4 Menu structure

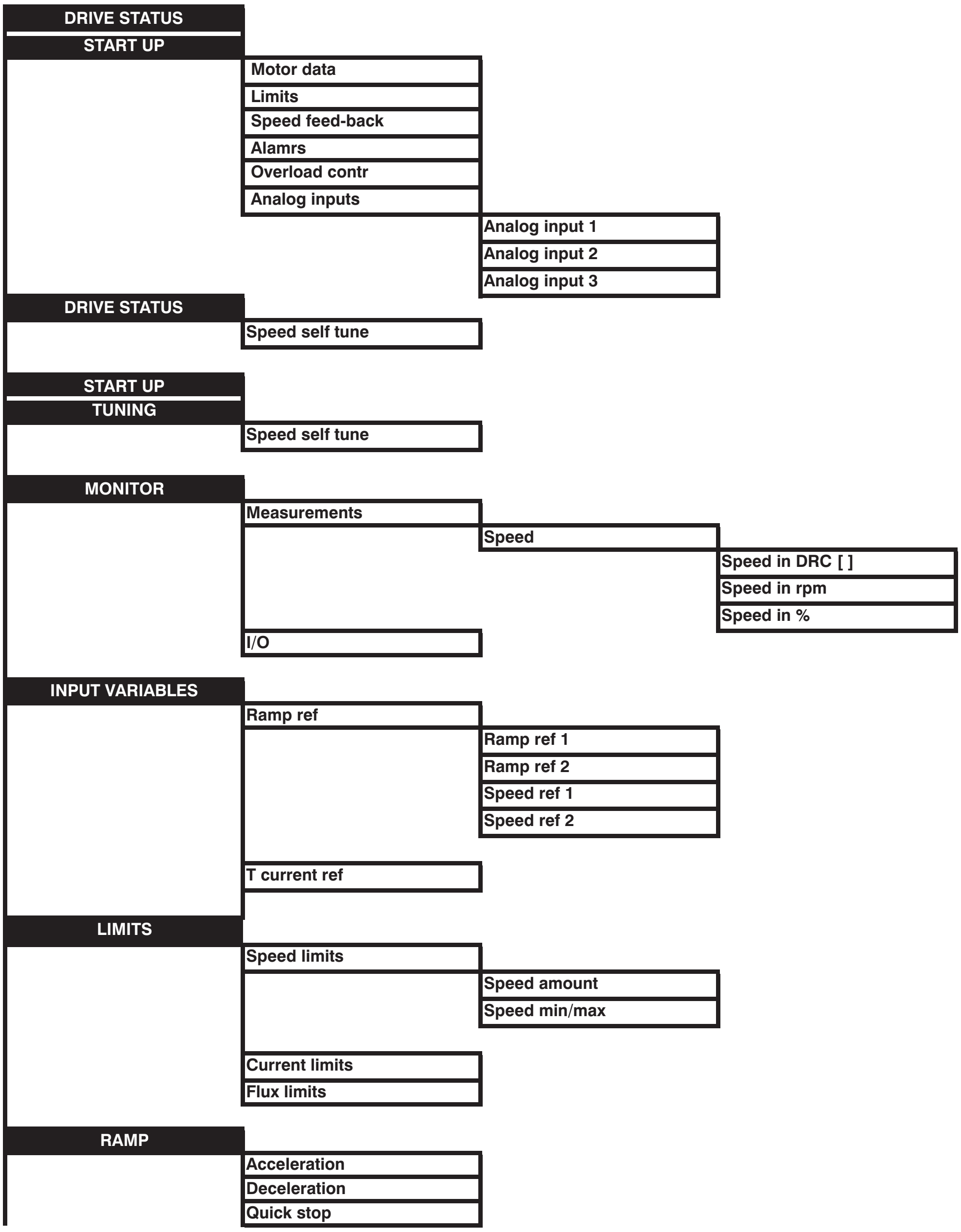
This structure contains a main menu, sub-menus and parameters. The structure can be compared to the directory and sub-directory trees on a computer.

The Main Menu	is the root directory
The Sub-menus	are the sub-directories
The Parameters	are the files

This structure can found both using the keyboard and browser in the optional DCVNCNF100 configuration software, and in the description of the functions developed in detail in chapter 5 of this manual.

The “List of parameters” in chapter 8 of this manual gives the values admitted by each of the parameters, their addresses and information on read/write capabilities.

Main menus with sub-menus



4.4 Menu structure

- **SPEED REGULAT**
  - Self tuning
  - Spd zero logic
  - Speed up
  - Droop function
  - Inertia/loss cp
- **CURRENT REGULAT**
- **FLUX REGULATION**
  - Flux \ if curve
- **REG PARAMETERS**
  - Percent values
    - Speed regulator
    - Flux regulator
    - Voltage reg
  - Base values
    - Speed regulator
    - Flux regulator
    - Voltage reg
  - In use values
- **CONFIGURATION**
  - Speed fbk
  - Drive type
  - Dimension fact
  - Face value fact
  - Prog alarms
    - Failure supply
    - Undervoltage
    - Overvoltage
    - Prog. Alarm \ Heatsink
    - Overtemp motor
    - External fault
    - Brake fault
    - I2t overload
    - Overcurrent
    - Field loss
    - Speed fbk loss
    - Opt2 failure
    - Bus loss
    - Hw opt1 failure
    - Enable seq err
  - Set serial comm
- **I/O CONFIG**
  - Analog outputs
    - Analog output 1
    - Analog output 2
    - Analog output 3
    - Analog output 4
  - Analog inputs
    - Analog input 1
    - Analog input 2
    - Analog input 3
  - Digital outputs
  - Digital inputs
  - Encoder inputs

4.4 Menu structure

- **ADD SPEED FUNCT**
  - Adaptive spd reg
  - Speed control
  - Speed zero
- **FUNCTIONS**
  - Double setup
  - Motor pot
  - Jog function
  - Multi speed fct
  - Multi ramp fct
    - Ramp 0
      - Acceleration 0
      - Deceleration 0
    - Ramp 1
      - Acceleration 1
      - Deceleration 1
    - Ramp 2
      - Acceleration 2
      - Deceleration 2
    - Ramp 3
      - Acceleration 3
      - Deceleration 3
  - Speed draw
  - Overload contr
  - Stop control
  - Brake control
  - I/n curve
- **SPEC FUNCTIONS**
  - Test generator
  - Links \ Link 1
    - Link 1
    - Link 2
    - Link 3
    - Link 4
    - Link 5
    - Link 6
  - Pad Parameters
- **OPTIONS**
  - Option 1
  - Option 2
  - PID
    - PID source
    - PID references
    - PI controls
    - PD control
    - PID target
    - Diameter calc
  - TORQUE WINDER
    - Diam Calculatio
    - Torque calculat
      - Comp calculat
      - Taper function
    - Speed demand
- **SERVICE**

4.5 Commissioning

Warning: Carefully follow all safety instructions, warnings and technical specifications given above!

Conventions:

positive speed	is the clockwise motor rotation speed seen from the output side of the drive shaft
negative speed	is the anti-clockwise motor rotation speed seen from the output side of the drive shaft
positive torque	is torque which produces clockwise motor rotation seen from the drive shaft side
negative torque	is torque which produces anti-clockwise motor rotation seen from the drive shaft side

4.5.1 Controlling assembly and auxiliary power

The following points need to be checked before the product is powered-on:

- The cables and shieldings must be correctly connected
- If the DC Drive current does not correspond to the motor nominal current, thermal protection relay should be used..

  Warning! External power sources must not be connected to the DC drive output

- Lock the DC drive (disconnect terminal 12)
- the following voltages should be present:
  - terminal 7 + 10V reference terminal 9
  - terminal 8 - 10V reference terminal 9
  - terminal 19 + 24 ... 30V reference terminal 18

- Select the **Actual spd (rpm)** parameter on the DRIVE STATUS menu.
- With the DC drive locked, turn the motor clockwise (seen from the drive shaft side). The value displayed will be positive
- If the value does not change, or if false values are displayed, check mains power and encoder or tachogenerator cabling
- If the value displayed is negative, encoder or tachogenerator connections must be inverted: channel A+ to A- or B+ to B- for the encoder and inversion of the connection for the tachogenerator.

4.5.2 DC drive factory settings

Note! Initially the DC drive has factory settings and is connected as per the diagram in chapter 3.1. The factory settings may be changed using the **Load default** parameter on the SPEC FUNCTIONS menu. Loading these settings means that all the modifications made by the user will be deleted. The exceptions to this rule are the **Size selection**, **Tacho scale**, and **Speed offset** settings. The speed feedback settings are not modified when the DC Drive is returned to factory settings.

The factory settings allow the speed to be regulated via a cascade current regulator through an DC machine with separate power source, equipped with a tachogenerator.

In this case, the de-energizing function is disabled. Regardless of the settings required, we recommend performing all the basic adjustments described below first of all, to avoid any possible errors.

4.5 Commissioning

The following settings should be entered with the DC drive locked.

Enable drive = disabled (no power to terminal 12).

Selection of mode of operation

- When the DC drive is only controlled from a terminal block, adjust the setting **Main commands** parameter = Terminals.
- When the keyboard is used, **Main commands** = “Digital”.

Save the settings

- Use the setting **Save parameters** on the START UP menu.

  Remember: To keep the changes to the settings even after the DC drive has been started and stopped, the settings need to be saved.
- When using the keyboard, press ENT.

The default setting Main commands is selected in “Digital” mode, so the current regulator is able to perform self-tuning.

4.6 Start-up procedure: Start Up Menu

START UP	Short menu for starting the DC drive, self-tuning regulation I inductance and speed.

4.6.1 Basic settings

By following the list in the START UP menu, the DC drive may be set up to perform frequently-used actions.

Speed base value	Range of total speed, in tr/mn, corresponding to 10V over an analogue input
Nom flux curr	Excitation regulator calibration, the value of which, when adjusted to the average of switch S14 or resistor R_{LA-LB} , will be reported in this parameter
Speed-0 f weak	Reducing excitation current speed to zero (field weakening)
Acc delta ...	Enables ramp gradient to be adjusted (acceleration)
Dec delta ...	Enables ramp gradient to be adjusted (deceleration).

Motor specifications (START UP / Motor data menu)

All the data referring to the motors are entered in this sub-menu.
Should it be necessary to self-tune the speed, these values should correspond to the specifications on the motor nameplate, because the motor torque constant is taken from there.

Motor nom flux	Rated excitation (field) current of the motor in A.
Flux reg mode	Field control: constant or variable current .
Full load curr	Rated motor armature current. The default value is the rated DC drive current. This current can be limited using the **T current limit** parameter.
Motor max speed	Maximum motor speed. Enter the value on the nameplate.
Max out voltage	Maximum output voltage. This is also the value which defines the start of the de-excitation (field weakening) stage if it has been selected.
Flux weak speed	Speed as a % of **Motor max speed** where de-excitation (field weakening) starts, following default **Speed fbk loss** management.

Note! As with speed self-tuning, these specifications need to be adjusted in line with the motor nameplate. These features can only be modified once the self-tuning procedure is complete, when the user enters the desired values.

Limits (START UP / Limits menu)

This sub-menu lists the speed, current and excitation limits used when they need to be different from the ones in the \Motor data sub-menu.

T current limit	Absolute limit of armature current as a % of **Full load curr**. The value of this limit depends on validation or otherwise of the **Enable overload** function.
Flux current max	Adjustment of the maximum excitation current as a % of **Motor nom flux**. By default it is the value re-entered in the **Motor nom flux** parameter.

4.6 Start-up procedure: Start Up Menu

START UP

Flux current min — Adjustment of the minimum excitation (field) current as a % of **Motor nom flux**. The default value is 5% of **Motor nom flux**. It is both the value of the low excitation current when the parameter **Speed-0 f weak** is enabled and the minimum limit of excitation current flux when no field weakening is applied.

Speed min amount — Sets the minimum speed of rotation.

Speed max amount — Absolute peak of reference speed; sets the maximum rotation speed.

Speed feedback (START UP / Speed feedback menu)

Speed fbk sel — Selection of type of speed feedback:

- sinusoidal encoder (encoder 1), or
- incremental encoder (encoder 2), or
- tachogenerator, or
- armature voltage.

Tacho scale — End adjustment coefficient for the tachogenerator.

2-pulse encoder — Number of pulses for each turn of the incremental encoder.

Note! Take care not to exceed a frequency of 150 KHz on encoder inputs!

Enable fbk contr — Enables coherence test on speed feedback This function requires **Motor max speed, Max out voltage, Flux weak speed** to be correctly set.

Refresh enc 2 — Enables the test, recording the presence of signals A, B, Aneg, Bneg on incremental encoder. This test is activated only if **Enable fbk contr** is enabled.

Alarms (START UP / Alarms menu)

Under voltage — Threshold of low voltage mains failure, taking into account whether the DC drive is unlocked.

Overcurrent thr — Threshold of excess current, which should be higher than T current limit.

Overload control (START UP / Overload control menu)

Overload control allows the user to provide an overload higher than the rated current of the DC Drive armature current for short periods of time. It is used to provide the drive with a temporary excess torque or, for example, to allow particular load peaks on machines subjected to cyclical loads.

Analogue inputs 1, 2, 3 (START UP / Analog inputs 1, 2, 3 menu)

DCVN-series DC drives offer the possibility of linking specific functions to three programmable analogue inputs, configured as differential inputs (terminals 1-2, 3-4, 5-6).

By default, the input 1 (terminals 1 and 2) is connected to **Ramp ref 1**.

START UP

4.6.2 Basic adjustments to the DC drive

Note! It is possible to dispense with self-adjustment if the control board or the control module are replaced as long as the parameters are saved using configuration software DCVNCNF100.

In any case, if the motor is replaced by a new one (even if it is identical), we strongly recommend that all self-tuning and calibrations be re-performed.

4.6.2.1. Self-tuning of the armature current regulator

This operation should be done the first time the DC drive is commissioned, or if the control board or the control module are replaced, or when a new motor is commissioned.

The current regulator is automatically optimised via the **R & L Search** parameter. The armature resistanceand inductancevalues are saved to the memory as **Arm resistance** and **Arm inductance** in the CURRENT REGULAT menu. If necessary, the user can change these parameters manually.

- Should excitation not be supplied by the DC drive, switch the motor field supply voltage off. The internal excitation regulator of the DC drive is automatically locked during armature current regulator self-tuning, so the field wires do not need to be disconnected in this case.
- The user should ensure that, during optimisation, the drive does not start to turn even when there is no field (magnetic remnants, serial field, etc.). If necessary, block the drive shaft mechanically.

Initial conditions.

- DC drive locked (no power to terminal 12)
- The **Main commands** parameter (START UP or CONFIGURATION menus) should be set to “Digital”.
- Prior to self-tuning, set the limit for the armature current (from 50% to 100% of **Full load curr**).
- If necessary, disable the “Overload control” function during optimisation (**Enable overload** = Disabled).
- Parameter **R&L search** in the START UP menu = Enabled
- Close the line contactor
- Prepare electrical unlocking of the DC drive (terminal 12) and enable it (terminal 13).
- Unlock the DC drive by using the **Enable drive** parameter on the START UP menu.

  Note! If the **Stop mode** parameter is not «OFF», press the START key on the keyboard.
- The self-tuning process begins. It may take several minutes.
- At the end of the self-tuning procedure, the DC drive is automatically disabled and the **R&L search** parameter on the START UP menu is configured as being = Disabled.
- Electrically lock the DC drive (no power to terminal 12)
- Adjust the **Main commands** parameter to the desired value.
- If wished, this overload control function can be enabled: (**Enable overload** = Enabled).
- Save the parameters.

Note! After booting up, the self-tuning procedure can be stopped through **Enable drive** = Disabled. The parameters adjusted prior to the optimisation procedure are, therefore, valid. Self-tuning cannot be performed if the DC drive is running.

4.6.2.2 Controlling armature current regulator performance using the E int [V] parameter.

During DC drive operation, the "Current Regulator" menu displays the **Eint** parameter, which measures internal current variations.
This value should be close to zero, but the values which develop dynamically and are between -40 and +40 are also accepted. **To consider the value displayed for this measurement as valid, the drive should have a load of at least 30%.** If necessary, modify the **Arm inductance** parameter slightly (on the Current regulator menu) to perform fine tuning and take the Eint parameter to an acceptable value.

- If the displayed value of **Eint** is positive, increase the value of **Arm inductance**.
- If the displayed value of **Eint** is negative, reduce the value of **Arm inductance**.

4.6.2.3 Self-tuning the speed regulator

The self-tuning procedure identifies the total value of drive shaft inertia (kg*m^2), the friction value in N*m and estimates the proportional and integral gains of the speed regulator.

Danger! This procedure requires the motor drive shaft to rotate freely. During the self-tuning adjustment phase take care with motor behaviour.

Warning! This test is performed using the torque value adjusted in the Test T curr lim parameter. The torque reference is applied using a reference step (no ramp); mechanical transmission should be compatible with this operation.With the help of this setting, the user can modify the upper torque limit.

Note ! In applications where the total system inertia value is very high, the value of the **Test T curr** lim parameter needs to be increased to avoid «Time out» gaps.

The speed loop self-tuning process is not appropriate for DC drives used in applications such as elevators and lifting systems.

The preliminary operations to be performed in order to reach a correct estimate of the torque constant «Torque const» and to conduct a correct self-tuning procedure, consist of entering the values on the motor nameplate for the following parameters:

Initial conditions

Motor max speed	Equal to the maximum speed given on the motor nameplate.
Fwd-Rev spd tune	Choice of the direction or rotation of the shaft for self-tuning.
Flux weak speed	Speed in % of **Motor max speed** where field weakening starts.
Current limit	Equal to the value indicated on the motor nameplate.
Motor flux curr	Equal to the value indicated on the motor nameplate.
Max out voltage	Equal to the value indicated on the motor nameplate.

4.6 Start-up procedure: Start Up Menu

START UP

These settings can be modified after the self-tuning procedure has been performed according to the requirements of the motor used, without modifying the **Torque const** value identified during the self-tuning procedure.
Fix the drive shaft rotation direction: clockwise (FWD) or anti-clockwise (REV) using the **Fwd-Rev spd tune** parameter.
Set the torque limits to be used during the speed loop self-tuning procedure, using the **Test T curr lim** parameter.
Select the START UP \ Speed self tune menu.
Perform the procedure using the **Start** command.
During this procedure, an acceleration test with the uppermost value of torque adjusted in the **Test T curr lim** parameter is performed, then a deceleration test with no motor command or any torque applied, until zero speed is reached.

The threshold speed at which the test is performed is 33% of the weakest value set on the following parameters:
- **Speed base value**
- **Speed max pos** or **Speed max neg** depending on direction of rotation.

This procedure will take a certain number of minutes, according to the inertia and friction values.

Depending on the values of inertia and friction, the DC drive will calculate the speed regulator gains (**Speed P** and **Speed I** parameters).
If certain manual adjustments are required (in case of vibration, etc.), they must be made in accordance with the integral gain value **Speed I [%]**. If the self-tuning procedure does not give satisfactory results, please refer to chapter 4.6.3 for the manual procedure “Manual adjustment of regulators”.
At the end of the procedure, the new parameter values (“Calc” suffix) can be compared with the values prior to the self-tuning procedure by looking at the ***Self tuning*** *menu*.

Values returned

Test T curr lim	Value of the current torque limit applied during the self-tuning procedure.
Inertia	Inertia value in kg*m^2 (1 kg*m^2 = 23.76 ib*ft^2).
Inertia Nw	New inertia value in kg*m^2 identified during the self-tuning procedure.
Friction	Value of friction in N*m (1 N*m = 0.738 ib*ft).
Friction Nw	New value of friction in N*m identified during the self-tuning procedure.
Speed P	Proportional gain of the speed regulator.
Speed P Nw	New value of the proportional gain of the speed regulator.
Speed I	Integral gain of the speed regulator.
Speed I Nw	New value of the integral gain of the speed regulator.
Take val	Acquisition of the new values of the parameters after self-tuning.

The new parameters can be enabled through the **Take val** command, after the DC drive has been locked. In this case, the values prior to the self-tuning procedure are deleted. This ***self-tuning*** can be repeated, even if the values from the previous attempt have not been confirmed.

START UP

Note! ***The self-tuning*** does not permanently memorise the values calculated, which are lost if the DC drive is turned off. To memorise the values obtained, the parameters need to be saved.

Where extreme values are found for certain parameters, error messages may appear. Repeat the self-tuning procedure. If the error message does not disappear, take the default values and adjust the speed regulator manually (chapter 4.6.3 «Manual adjustment of regulators»).

List of error messages during the self-tuning procedure

General messages

"Drive disabled":	Power up terminal 12 (ENABLE) to a voltage = +24 V.
«Not ready»:	**Take val** cannot be performed because the test has not been conducted correctly. Repeat the self-tuning procedure.
«Time out»:	The self-tuning procedure has not been achieved within the time given.
«Start ?»:	Press ENT to confirm start of self-tuning test.
«Tuning aborted»:	The self-tuning test has been disabled by the user (the CANC key has been pressed.
"Set Main cmd=Dig":	Select the CONFIGURATION menu and display the **Main commands** = digital parameter.
«Set Ctrl=Local»:	Select the CONFIGURATION menu and display the **Control mode** = Local parameter.

Error messages for measurements

These messages may appear when extreme values have been detected for the parameters. It may be useful to repeat the self-tuning procedure when one of the following error messages appears. If the message does not disappear, the manual setting procedure must be performed.

"Over speed"	
"Drive stalled":	Increase the value of the Test **T curr lim** parameter and repeat ***Self-tuning***.
"Load applied":	An excessively-high resistant torque value has been detected at zero speed. Self-tuning cannot be performed with this type of load.
"T curr too high":	Decrease the value of the Test **T curr lim** parameter for ***Self-tuning***.
"Friction null":	The friction value = zero or is lower than the regulator accuracy limit.

START UP

4.6.2.4 Auto-tuning the excitation controller

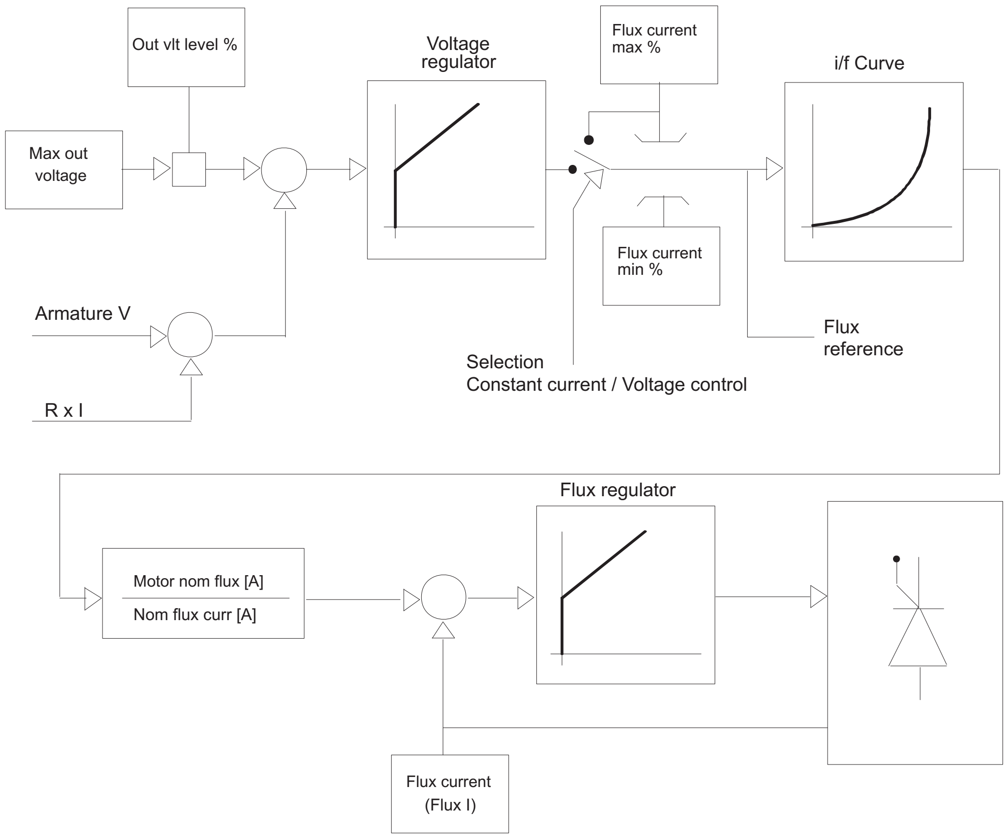


Figure 4.6.2.4.1: Functional diagram of excitation controller.

The default setting for DCVN DC drive operation is for them to work without field weakening. The following settings should only be used when field weakening is required or when motor field excitation is not powered by the DC drive's excitation regulator.

All the adjustments described in this chapter should be performed with the DC drive locked (no power to terminal 12). Selection of mode of operation:

- Direct field current: **Flux reg mode** = Direct current
  Enable flux reg = Enabled
- With field weakening: **Flux reg mode** = Voltage control.
  Adjust maximum armature voltage in the CONFIGURATION menu using the **Max out voltage** parameter.
  Enable flux reg = Enabled
- External excitation **Flux reg mode** = External control
  Enable flux reg = Disabled.

Adjustment of rated excitation current

- Adjust the rated excitation current for the motor using the **Motor nom flux** parameter.
- When the excitation current of the motor is lower than the rated current of the excitation regulator, the current on the field converter can be adjusted using the S14 switch or the R_{LA-LB} resistance, as indicated in Chapter 2.3.3.

Maximum/minimum value of the excitation current

- Adjustment in the LIMITS / Flux limits menu using the **Flux current max** and **Flux current min** parameters, given as a % of **Motor nom flux**.

START UP

4.6.3. Manual adjustment of regulators

The adjustment of DCVN Drive regulators requires certain pre-defined values. It is, therefore, normally possible to obtain satisfactory behaviour from the regulators. Adjustment of the armature current regulator should always be performed. When the adjustment meets requirements, there is no need to optimise the other regulators.

The DC drive contains the following regulator circuits:
- Armature current regulator. Self-tuning is achieved using the **R&L search** parameter
- Speed regulator: available self-tuning procedure.
- Field current regulator: can only be adjusted manually
- Armature voltage regulator: can only be adjusted manually.

The following paragraphs describe how to optimise the regulators manually, if necessary.
To obtain step operations, the internal generator “Test generator” is used (“SPEC FUNCTIONS” menu). The objective is to obtain an optimal response to a step. As with the current, the response to a step can be measured directly.
The analogue output, reported to the terminal block, shows a sample time of two milliseconds.

Using the test generator
This function provides signals in the form of a square wave with adjustable frequency and amplitude. These signals can be added to an offset which can also be adjusted. The **Gen access** parameter defines which PID regulator input the signal will act on. Chapter 5.15.1 “Test generator” describes how to implement the test generator.

4.6.3.1 Manual adjustment of the speed regulator.

- DC drive locked = no power to terminal 12
- Choose the following settings for the Test generator:
  - **Gen access** = Ramp ref
  - **Gen frequency** = 0.2 Hz
  - **Gen amplitude** = 10 %
  - **Gen offset** = 10 %
- Measures return on an analogue output. To this end, set the variable «Actual Spd» to one output and the variable «Motor current» to another (I/O CONFIG menu).
- Adjust the **Acc delta speed** parameter to the highest possible value and the **Acc delta time** parameter to 1 second in the START UP menu.
- Adjust the **Speed P** and **Speed I** parameters to 0.00 in the REG PARAMETERS / Speed regulator menu.
- Start the drive (voltage to terminal 12) and give the order to Start (voltage to terminal 13).

  Parameters available

Speed P	Proportional gain of the speed regulator.
Speed I	Integral gain of the speed regulator.
Prop filter	Time constant of the filter for the component P of the speed regulator

- Increase **Speed P** until the overshoot is less than 4% with the lowest possible reaction time.

START UP

- Increase **Speed I** until the overshoot is over 4 %. Reduce it until the value is slightly under 4%.
- Stop the drive and block it.
- **Gen access** = Not connected
- Save the parameters.

Note! When the «Bypass» function is enabled (**Enable fbk bypas** = Enabled) the DC drive is automatically switched to armature feedback until a speed feedback signal appears.

Gains may be significantly different in armature feedback mode. The procedure described above for the optimisation of the speed regulator in this mode must be performed again. P (proportional) gain of the speed regulator is adjusted using the **Speed P bypass** parameter, whereas I (integral) gain is adjusted using **Speed I bypass**.

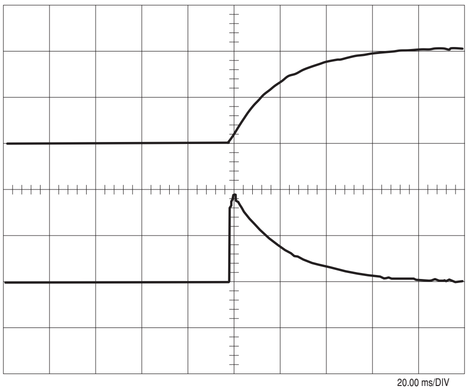


*Figure 4.6.3.1.1: **Speed P** too weak.*
Rising: Actual spd, falling: Motor current.

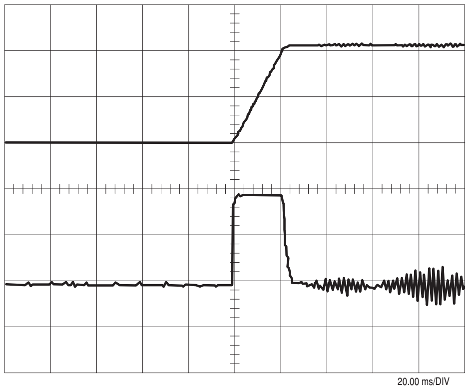


*Figure 4.6.3.1.2 **Speed P** too high.*
Rising: Actual spd, falling: Motor current.

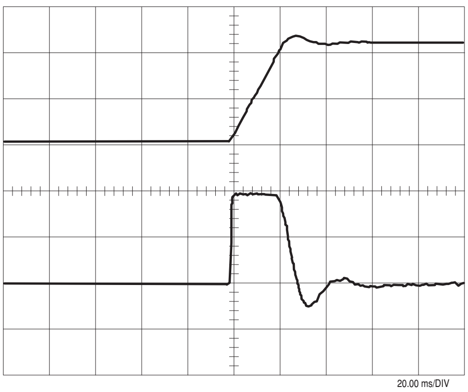


*Figure 4.6.3.1.3: **Speed I** too high.*
Rising: Actual spd, falling: Motor current.

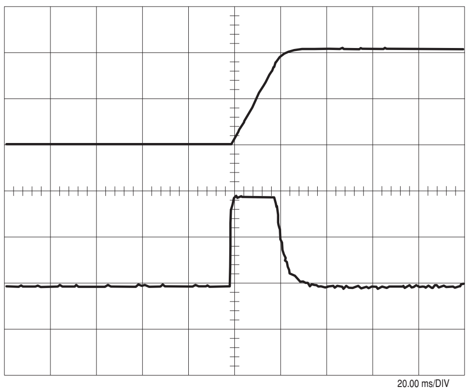


*Figure 4.6.3.1.4: **Speed P** and **Speed I** are correctly adjusted.*
Rising: Actual spd, falling: Motor current.

START UP

4.6.3.2 Manual tuning of excitation controller

Note! In most cases, A/C motors and those with separate excitation work at a direct field current (**Flux reg mode** = Direct current) In this case, the excitation regulator and the armature current regulator do not require optimisation.

The procedure described above refers to drives operating at constant torque and strength (mixed adjustment of armature and excitation). In these cases, first of all the excitation regulator needs to be configured to reflect the mode of operation chosen.

Note! During the excitation regulator optimisation procedure no Start order will be accepted.

- DC drive locked (no power to terminal 12)
- LIMITS / Flux limits menu: **Flux current max** = 100 % equalling the rated excitation current of the connected motor; **Flux current min** = 0

  Parameters available

  Flux P Proportional gain, as a % of the excitation regulator

  Flux I Integral gain, as a % of the excitation regulator

- Adjust the **Flux I** and **Flux P** parameters to 0.00 in the REG PARAMETERS / Flux regulator menu.
- Measure the excitation current on an analogue output. To this end, set the variable “Flux current” to one output and the variable “Flux reference” to another (I/O CONFIG menu).
- Select the FLUX REGULATION menu
- **Enable flux reg** = Enabled (standard)
- **Flux reg mode** = Voltage control
- **Enable flux weak** = Enabled
- **Gen access** = Flux reference and
- **Gen amplitude** = 70 % equalling the rated excitation current of the motor (this allows system deviation)
- Increase the value of the **Flux P** parameter until the excitation current overshoot (Flux current) is less than 4 %.
- Increase the value of **Flux I** until the overshoot is over 4 %. then reduce it until the value is slightly under 4%.

  Note! Because of the relatively high excitation time constant, the speed at which the current rises is limited. The time required for it to rise, when optimally setted, may be several hundred milliseconds.

  However, since the excitation regulator has a semi-controlled rectifier bridge (diodes and thyristors), the time it takes for the current to drop in the inducer circuit only depends on its time constant.

- **Gen access** = Disconnected
- **Enable flux weak** = Disabled
- Adjust the **Flux current min** parameter to the desired value.
- Configure the analogue outputs according to the different requirements expressed.
- Save the parameters.

START UP

The following figures show a few examples of adjusting the excitation regulator

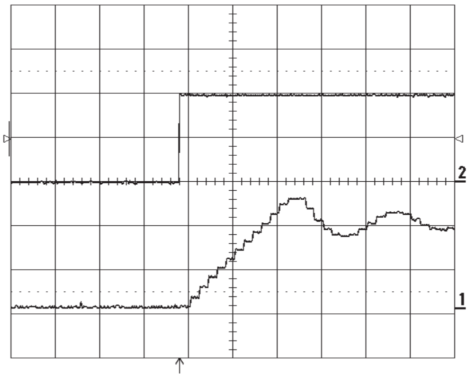


Figure 4.6.3.2.1: Excitation current oscillation. Non-optimal regulator behaviour. Rising: Flux reference, falling: Flux.

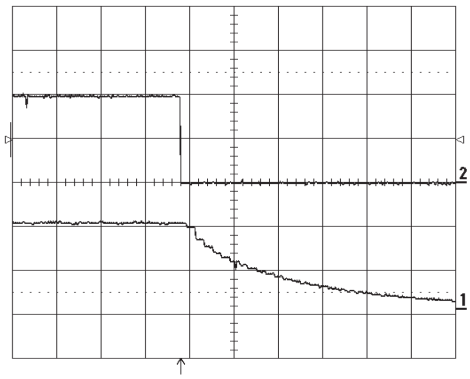


Figure 4.6.3.2.2: Field time constant too high. Low field current is too much a function of the field time constant. Adjustment has not affected it. Rising: Flux reference, falling: Flux.

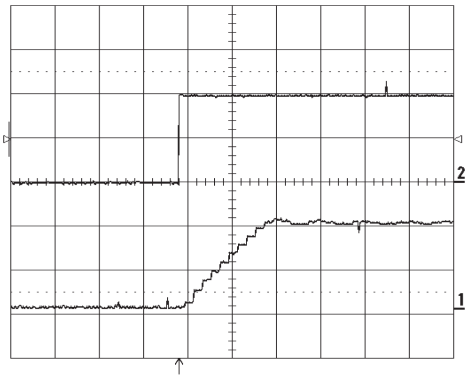


Figure 4.6.3.2.3: increase of the excitation current without oscillation. Variation in comparison with Fig. 4.6.3.2.1: increase of Flux P from 2 to 10 %. Flux I = 5 % Rising: Flux reference, falling: Flux.

4.6.3.3 Manual tuning of the voltage loop in the excitation controller

In most cases, DC motors and those with separate excitation work at a constant field current (**Flux reg mode** = Constant current). In this case, the excitation regulator and the armature current regulator (loop) do not require optimisation.
When field weakening, the voltage regulator keeps the armature voltage constant, even when the speed increases. The critical point for this regulator is at the start of field weakening. The aim, then, is to adjust the regulator in such a way that the armature voltage is extremely constant and only varies very slightly.

Note! Prior to optimising the voltage regulator, the other drive regulators should already have been adjusted.

4.6 Start-up procedure: Start Up Menu

START UP

Initial conditions.

- Drive locked = no power to terminal 12
- Choose the following adjustments for the Test generator:
  - **Gen access** = Ramp ref
  - **Gen frequency** = 0.2 Hz
  - **Gen amplitude** = 10 %
  - **Gen offset** = Depending on de-excitation point. E.g.: **Motor max speed**= 2000 rpm (t/mn), the de-excitation commences at 1500 rpm. **Gen offset** = 75 %
- Measure the field current and the armature voltage on an analogue output. To this end, set the variable “Flux current” to one output and the variable “Output voltage” to another (see “Input/Output programming).
- Start the DC drive with the Start command (voltage to terminals 12 and 13).

Parameters available

Voltage P	Proportional gain, as a % of the voltage regulator
Voltage I	Integral gain, as a % of the voltage regulator

- The P (proportional) and I (integral) gains of the voltage regulator can be modified from the REG PARAMETER \ Voltage regulator using the **Voltage P** and **Voltage I** parameters
- Controlling armature voltage. After a possible brief oscillation, the voltage should remain constant.
- Lock the DC drive
- **Gen access** = Not connected
- Save the parameters.

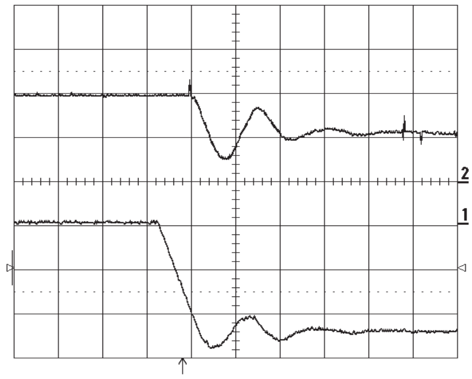


Figure 4.6.3.3.1: oscillations of the armature voltage. Voltage P = 10 %, Voltage I = 80 % Rising: Flux, falling: Output voltage.

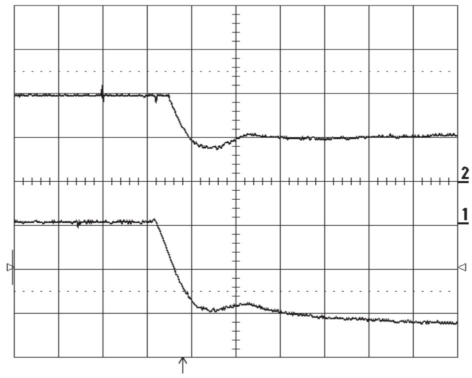


Figure 4.6.3.3.2: gain too weak. Armature voltage increases Voltage P = 3 %, Voltage I = 5 % Rising: Flux, falling: Output voltage.

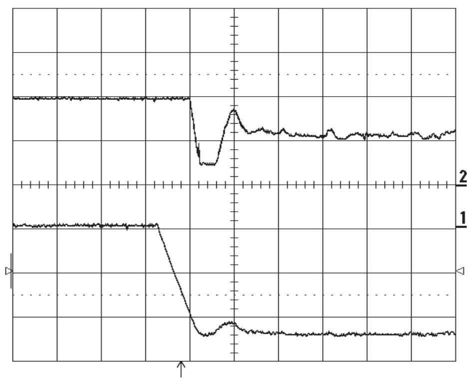


Figure 4.6.3.3.3: Excitation controller optimised: After a brief interval, the excitation current and the armature voltage remain constant. Voltage P=40% Voltage I=50% Rising: Flux, falling: Output voltage.

4.6.4 Advanced drive settings

4.6.4.1 Calibrating the If curve (FLUX REGULATION/Flux / if curve menu)

Calibrating this curve is designed to control, under reflux conditions, the actual flux of the motor and thus to control torque better. The figure below describes the relationship between flux and excitation current under standard conditions (curve A), or when the **Flux /if curve** function is selected (curve B).

Note ! Adjusting the excitation regulator and the armature voltage should have been performed first, following the instructions given above, before commencing this setting.

The succession of stages for calibration is as follows:
- Adjusting the excitation regulator
- Calibrating the flux curve (Flux / if curve)
- Adjusting the voltage loop in the excitation regulator

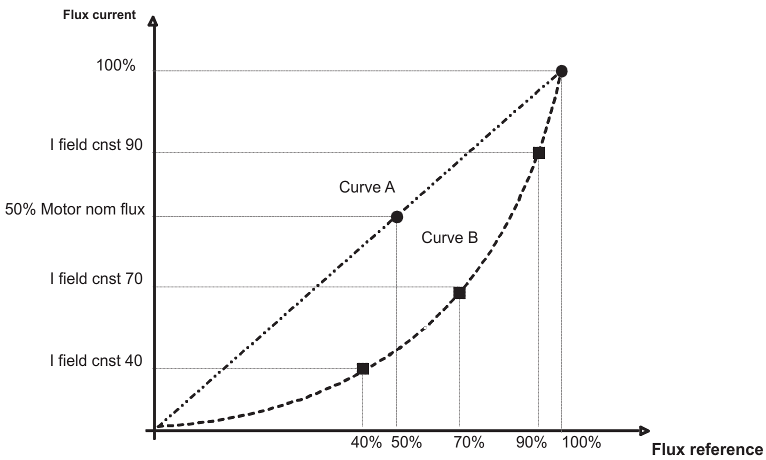


Figure 4.6.4.1.1: flux/current conversion curve.

Calibration procedure:

- Make the flux / current curve linear, using the **Reset flux / if** command (FLUX REGULATION/Flux / If curve menu)
- Adjust the excitation current of the motor (data on nameplate) in the **Motor nom Flux** parameter (FLUX REGULATION menu)
- Adjust the armature voltage desired for the **Max out voltage** parameter (CONFIGURATION menu) and the relative % (100%) in the **Out vlt level** parameter (FLUX REGULATION menu)
- Adjust the excitation regulator in direct current mode: **Flux reg mode** = Direct current (FLUX REGULATION menu)
- Set **Flux current max** to 100% (FLUX REGULATION menu)
- Take the motor up to a speed where the armature voltage displayed in **Armature voltage** (MONITOR\Measurements menu) is the same as the value previously adjusted in **Max out voltage**

Determination of the point on the curve at 90% excitation reference (I field cnst 90)

- Via the **Flux current max** parameter, reduce the voltage displayed in **Armature voltage**, until reaching an armature voltage equal to 90% of **Max out voltage**.
- Report the measurement (in %) of the excitation current using the **Flux current** parameter (FLUX REGULATION menu) and enter it in the **I field cnst 90** parameter (FLUX

REGULATION\Flux if curve menu).

Determination of the point on the curve at 70% excitation reference (I field cnst 70)

- Proceed in the same way to bring the armature voltage to 70% of **Max out voltage**
- Report the corresponding excitation current (in %) and enter it in the **I field cnst 70** parameter

Determination of the point on the curve at 40% excitation reference (I field cnst 40)

- Proceed in the same way to bring the armature voltage to 40% of **Max out voltage**
- Report the corresponding excitation current (in %) and enter it in the **I field cnst 40** parameter
- Lock the DC drive.
- Enable the estimate of the new curve using the **Set flux / if** parameter (FLUX REGULATION menu). The operation may take a few seconds.
- Return the **Flux current** max value to 100%.
- Select the desired mode of operation for the excitation regulator (fixed excitation or field weakening).
- In the latter case, the field excitation voltage loop needs to be adjusted, as indicated above.
- Save the parameters.

Note! Changes to **Max out voltage** or **Motor nom flux** requires a new calibration of the curve.

4.6.4.2 Speed-up function (SPEED REGULATION\ Speed up menu)

Oscillations may occur during speed variations with loads. Such oscillations can be reduced by enabling the “Speed-up” function which acts on the DC drive speed regulator. The following figures show how this function affects performance.

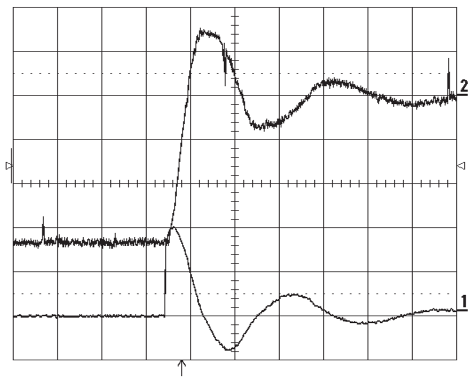


Figure 4.6.4.2.1: Speed-up function disabled. Oscillations during speed variation caused by high inertia momentum. Rising: Actual speed, falling: motor current.

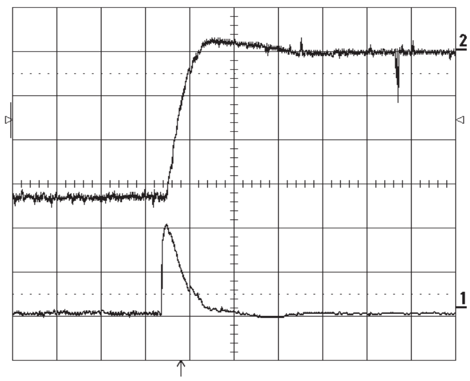


Figure 4.6.4.2.2: Speed-up function enabled. The same drive with a Speed-up function enabled. Rising: Actual speed, falling: motor current.

Parameters used in this example:

Speed up base	14 rpm/ms
Speed up gain	50 %
Speed up filter	20 ms

START UP

4.6.4.3 Speed zero logic (SPEED REGULATION \ Speed zero logic menu)

- This function, whose default is "disabled", determines how the DC drive will behave when the motor is stopped. It suppresses proportional and/or integral gain of the speed regulator when the reference and speed feedback are zero.
- Please refer to Chapter 5.7.3 for implementing this function.

4.6.4.4 Adaptive speed regulator (ADD SPEED FUNCT \ Adaptative speed reg menu)

- The default for the adaptive speed regulator is disabled (**Enable spd adap** = Disabled)
- The gains defined and adjusted in this function replace these parameters in the REG PARAMETERS \ Speed regulator menu
- It should only be used if the speed regulator gains must be modified as a function of the speed (**Select adap type** = Speed) or based on a separate control (**Select adap type** = Adap reference). In this latter case, an analogue input of the parameter **Adap reference** is required to perform an external control of the proportional and integral gains of the speed regulator
- If **Adap speed 1** and **Adap speed 2** are entered, three different speed intervals are available with several gains. The values are expressed in % of **Speed base value** or the maximum value of **Adap reference**.
- When **Select adap type** = Speed, optimisation is performed as described for optimising speed regulator gains. However, the following points must be considered for this function.
- Using **Gen offset** to regulate a speed value at the start of the interval to be optimised but which is also outside the interval fixed using **Adap joint XX**.
- Amplitudes are regulated with **Gen amplitude**, so that speed remains within the range to be optimised.
- Optimisation should be performed separately for each range and the regulator parameters are defined for each speed range using **Adap P gain XX** and **Adap I gain XX**.
- After optimising the different phases, conduct a test on the whole range of speeds.
- When changing the value of **Adap joint XX**, certain temporary effects caused by changes to gain from one speed range to another may be reduced. By increasing the value of this parameter the "transitory" effects are attenuated even further.
- Save the parameters.

Note!
- When **Select adap type** = Adap reference: optimisation is system-dependent.
- When speed zero logic is enabled, the changes made are enabled when the motor is stopped.
- Please refer to Chapter 5.13.2 for how to implement this function.

Note:

5 - Main functions

General information

- DCVN-series DC drives have certain functions which need to be set and performed, to adapt them to the requirements of the application for which they are to be used.
  The DC drive can be controlled in the following ways:

  - through the terminal block
  - through the keyboard
  - through an RS 485-series interface
  - through a CANopen bus link (optional).

- The choice of how to control it can be made with the **Main commands** and **Control mode** parameters in the CONFIGURATION menu

- The DCVNCNF100 configuration software (optional) makes it easy to set the parameters, control and put the DC drive to work thanks to its intuitive graphic interface and numerous inbuilt tools:
  - unaligned control terminal
  - dynamic visualisation of variables
  - graphic setting of regulators and functions, input/output assignment
  - trend curves
  - saving and editing the regulator files
  - online contextual help
  - controls up to 32 DC drives on a Modbus network

  The software works on a Windows 95® or higher environment.

- DCVN-series DC drives allow reference values for the ramp and the speed regulator to be set in different units of measurement.
  - in **Speed base value** %
  - in a unit of measurement (dimension) that the user can define and enter in the desired scale using the Dimension fact of the CONFIGURATION menu, e.g. speed in m/s.

  The two systems of units are linked, i.e. the modification of one system will cause the modification of the other.

- The existence of a password (**Pword 1**), prevents the DC drive being used by unauthorised persons. Password 2 (**Pword 2**) is reserved for Schneider Electric and grants access to the Service menu which cannot be accessed by the user.

Remember! The modified parameters must be saved, otherwise the previous parameters will be reloaded when the DC drive is turned on again.

General information

Parameter legend:

1	2	3	4			5	6	7	8	9
Parameter	No.	Format	Value			Standard Configurat.	Keyp.	Access via		
			min	max	Factory			RS	Term	D/P
Fast stop	316	U16	-	-	-	Term. 13	-	R/W	14	R/W
c No Fast Stop						+15…30 V		1	H	1
Fast Stop						0 V		0	L	0
a DRIVE STATUS										
Ramp ref 1 [FF] **b**	44	I16	-2 * P45	+2 * P45	0		Yes	R/W	IA, QA	R/W
Enable drive	314	U16	0	1	Disabled	Term. 12	Yes	R/W	12	R/W
Enabled						+15…30 V		1	H	1
Disabled					(0)	0 V		0	L	0

a White text on a black background — Menu/sub-menu.

b Black text on a white background — Accessible functions.

c Parts on a grey background — Function not accessible from the keyboard. The corresponding parameter status only is displayed.

1 [FF] in the Parameter column — Dimension based on the factor function.

2 "N" column : (Number) — **Parameter number (decimal). The value 2000H (=decimal 8192) must be added to the number given in column "N". to obtain the parameter address using RS485 or CANopen.**

3 "Format" column: — Internal parameter format:

I = Integer (e.g.: I 16 = 16 bit integer).
U= No polarity (e.g.: U32 = 32 bit, no polarity).
Float = Floating value.

4 "Value" columns — Minimum, maximum and factory-set values.

S= the value depends on the size of the product.

5 "Standard Configuration" column: — Factory assignation or possibility of assignment.

6 "Keyboard" column : — Yes = Parameter accessible via keyboard.

7 "RS" Column (RS485/Bus/DCVS5W04) — Parameter accessible via RS485 link, CANopen DCVS5Z27 board or via the DCVS5W04 applications development and programming board in "manual communications" mode

Low priority.

The figures indicate the value to be sent during communication to enable the parameter.

8	"Terminal" (Terminals) column	Parameters which might be assigned to one of the analogue input/output terminals or digital ones.
9	«D/P» Column (DCVS5W04/PDC)	Parameter available via asynchronous communication (see DCVS5W04) and/or Process Data Channel /PDC Manual). «DCVS5W04, in asynchronous communication mode» = Low priority «PDC» = High priority When using a bus link, parameters between [min = 0; max = 1] can be allocated to any virtual digital input (if there is an access code W) and/or virtual digital output (if there is an access code R). The figures indicate the value to be sent during communication to enable the parameter.
	IA, QA, ID, QD in the "Terminal" column	This gives access to the function through a programmable analogue or digital input or output. IA = analogue input QA = analogue output ID = Digital input QD = Digital output The figure which appears is the one through which the terminal is allocated.
	H, L in the "Terminal" column	Signal level (H=Status 1, L=Status 0) allowing the function to be enabled.
	R/W/Z/C	Can be accessed via the serial link, CANopen or via the applications development and programming board in "manual communications" or "asynchoronous" mode: R = Read, W = Write, Z= writing is only possible if the function is not enabled. C= command parameter (entering a value causes a command to be executed).
	X · Pyy	The value of the parameter may be min/max X times the value of parameter yy.

5 - Main functions

General information

Menu structure:

	Function	Chap	Page
DRIVE STATUS	Basic displays and reference	5.2	9
START UP	Short menu for starting the DC drive, self-tuning, armature I regul. and speed	4.6	21
TUNING	Speed regulator adjustment parameters, Iexcitation Uarmature	5.2	9
MONITOR	Measurements, viewing references, speeds, voltage, current, I/O	5.3	10
INPUT VARIABLES	Ramp reference, speed reference, current reference	5.4	14
LIMITS	Speed limits, current limits, excitation current limits	5.5	21
RAMP	Acceleration, deceleration, fast stop, S-ramp, ramp freezing	5.6	26
SPEED REGULAT	Functions of the speed reg., speed zero logic, self-tuning, derivation, equalising	5.7	31
CURRENT REGULAT	Armature current regulator function	5.8	39
FLUX REGULATION	Excitation regulator, flux/if curve functions.	5.9	41
REG PARAMETERS	Adjustment of speed, excitation current, armature voltage regulators	5.10	45
CONFIGURATION	Mode of operation, return type, scaling, default allocation, communication, password	5.11	47
I/O CONFIGURATION	Allocation of digital, analogue, encoder inputs/outputs	5.12	65
ADD SPEED FUNCT	Re-starting discharge, variable gains, speed thresholds	5.13	81
FUNCTIONS	Motorised Pot, jog, multi-speed, multi-ramp, sliding, overload control, stop modes, limitation I armature depending on speed	5.14	87
SPEC FUNCTIONS	Test generator, saving, factory settings, defaults, signal adaptation, words	5.15	114
OPTIONS	Vertical movement, double conf. PID, wind/unwind	5.16	124
SERVICE	Reserved		

5.1 DC drive validations

The following electrical validations are also required, whatever the DC drive command mode (terminal block/keyboard/serial link).

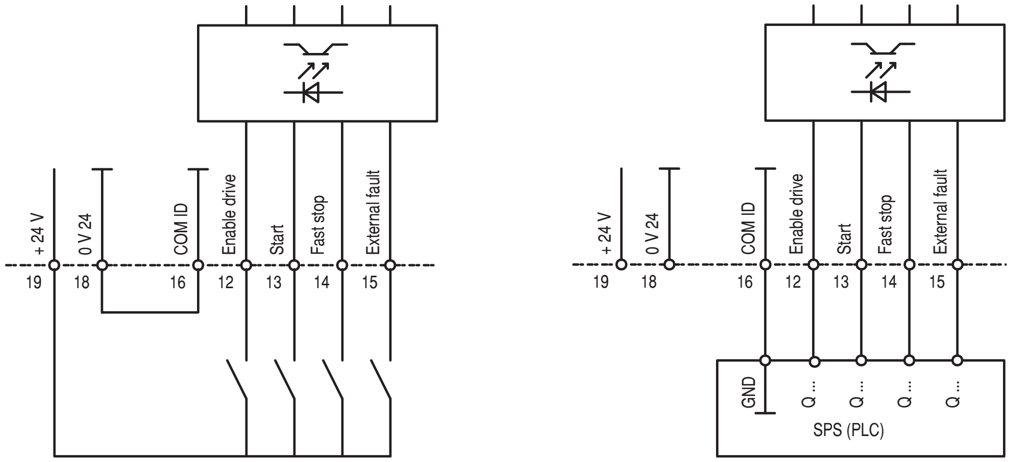


Figure 5.1.1: DC drive validations via dry contacts or auto-outputs.

- Control inputs: +15 ... 30 V. The inputs are protected against reverse polarities
- The reference point for validation inputs is terminal 16.
- When one uses an operator keyboard or a serial link (Mains Command = Digital) the control inputs and the corresponding commands on the keyboard/serial link are required. If a control input is reset to zero, restarting in this command mode can only be done if the input is reset to status 1.

There are four types of validation signal which have a different effect on the behaviour of the DCVN●●● DC drive.

- **Enable drive**	Unlocks the DC drive
- **Start**	Starts the DC drive
- **Fast stop**	Immediately resets the speed reference to zero, electrical braking according to the ramp defined by “**QStp delta speed [FF]**” and “**QStp delta time [s]**”.
- **External fault**	External fault, on which action the DC drive can be configured (default: lock).

5.1 DC drive validations

5.1.1 Unlock DC drive (enable drive)

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
DRIVE STATUS										
Enable drive	314	U16	0	1	Disabled	Term. 12	Yes	R/W	12	R/W
Enabled						+15…30 V		1	H	1
Disabled					(0)	0 V		0	L	0

This parameter, if disabled, locks the bridge pulses, removes the output voltage, and cancels any input command. Resetting the input to zero will have the same affect.

In keyboard operations, the command **Enable drive** is available on the DRIVE STATUS, START UP, TUNING menu and on the MONITOR menu.
When the **Enable drive** parameter is used via the keyboard (**Mains command** = digital) voltage needs to be applied to terminal 12.
When the **Main command** parameter is adjusted to "Terminals", **Enable drive** becomes a read-only parameter.

5.1.2 Start / Stop

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
DRIVE STATUS										
Start/Stop	315	U16	0	1	Stop	Term. 13	Yes	R/W	13	R/W
Start						+15…30 V		1	H	1
Stop					(0)	0 V		0	L	0

When **Main commands** is set to **digital**, the **Start**/**Stop** parameter is used to start the DC drive and the STOP key on the keyboard is enabled to stop the DC drive.
When **Main commands** is set to **terminals**, **Start**/**stop** becomes a read-only parameter.

Note! Apart from the Start command, the following signals are required to make the DC drive operate:

- **Enable drive**
- **Fast stop**
- **External fault**

The behaviour of the DC drive, once the **Start** command has been enabled or disabled, depends on the parameters in place at the time:

- When using the ramp (**Enable ramp** = Enabled and **Enable spd reg** = Enabled) the DC drive accelerates in line with the adjusted ramp until the required speed is reached. If the Start command is disabled, the DC drive decelerates, as per the defined ramp. If the Start command is selected again during deceleration, the DC drive starts to accelerate again until the required speed is reached.
- If the value **Speed ref 1** is directly controlled by the speed controller without using the ramp (**Enable ramp** = disabled and **Enable spd reg** = enabled), the DC drive accelerates to the required speed on the current limiter, as soon as the Start command is activated. When the Start command is de-activated, the value **Speed ref 1** is immediately set to zero, deceleration occurs on current limitation on the DCVN104.
- When torque is set to (**Enable spd reg** = Disabled) the **Start** command enables the torque reference (**T current ref 1**) or disables it after having disabled the **Start** command. The Start command does not affect the correction value **Speed ref 2** (with speed adjustment) or **Torque ref 2** (with torque setting).

The **Start** command is not required for Jog operating mode.
If the Start and Jog + or Jog - commands are given simultaneously, the **Start** command will have priority.

- The status of the Start parameter is displayed under DRIVE STATUS and in the MONITOR menu.

5.1.3 Fast stop

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
Fast stop	316	U16	-	-	-	Term. 13	-	R/W	14	R/W
No Fast Stop						+15…30 V		1	H	1
Fast Stop						0 V		0	L	0

Note! This function cannot be executed from the keyboard.

Application: **Fast stop** is used in emergency or dangerous situations to stop the drive as quickly as possible by electrically braking with the ramp adjusted using the **Qstp delta speed** and **Qstp delta time** parameters, providing that the DC drive is a 4-quadrant type (DCVN104).

When the motor is stopped, the DC drive is enabled and torque is generated. The Start or Enable drive command needs to be disabled for it to be locked.

How the DC drive behaves after the **Fast stop** command will depend on the operating mode selected:

- Control to the terminal block (**Main commands** = Terminals):
  The DC drive brakes if terminal 14 is disabled. When this terminal goes over to status 1, the DC drive re-accelerates automatically to the reference value required (pre-requisite: the other validation commands are still enabled).
- Operation via the serial link using the commands given via the terminals (**Main commands** = Digital):
  The DC drive brakes until it stops. When terminal 14 goes to status 1, there is no automatic startup. The **Start** command must be used to re-start.
- If the **Fast stop** command is given via the serial interface and terminal 14 remains enabled, fast stop is executed until the DC drive stops. The **Start** command needs to be enabled to re-start the DC drive.

5.1.4 Quick stop

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
Quick stop	343	U16	-	-	-		-	R/W	-	-
No Quick stop								1		
Quick stop								0		

Note! This function can only be executed via the serial link or by CANopen communication.

Application: **Quick stop** is used in emergency or dangerous situations to stop the drive as quickly- as possible by electrically braking with the ramp adjusted using the parameters **Qstp delta speed** and **Qstp delta time**, providing that the DC drive is a 4-quadrant type (DCVN104).

In comparison with the **Fast stop**, mode, when the motor is stopped, the DC drive locks and provides no more torque. The **Start** command needs to be enabled to re-start the DC drive.

5.1.5 External fault

The **External fault** command allows the user to associate processing of an external wired fault.

Example of how it is used

A pressure switch, which opens once a top pressure has been reached, causes the DC drive to go into fault mode, displaying the message “External fault”.

- Whatever the DC drive control mode, the signal always needs to be enabled for the DC drive to work.
- If an external fault arises, the DC drive will behave in accordance with the configuration entered under “Programming Alarms”.

5.2 Introduction to functions

The previous chapters referred to the different modes of controlling the DC drive and how to perform the initial calibrations on the adjustment loops.
This chapter describes the main functions of the DC drive (and how to set them).

DRIVE STATUS Basic displays and reference

This is the first menu displayed on the keyboard each time the DC drive is turned on.
It is used to read the basic parameters of the DC drive prior to commissioning and also to display the main speed reference **Ramp ref 1** for ramp input.

TUNING Speed regulator, Iexcitation Uarmature adjustment parameters

This menu can be used after the first commissioning to repeat the self-tuning procedure of the speed and current regulators and for manual adjustment of the main regulator adjustment loops.

5.3 Monitor

MONITOR Measurements, viewing references, speeds, voltage, current, I/O

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
MONITOR										
Enable drive	314	U16	0	1	Disabled	Term. 12	Yes	R/W	12	R/W
Enabled						+15…30 V		1	H	1
Disabled					(0)	0 V		0	L	0
Start/Stop	315	U16	0	1	Stop	Term. 13	Yes	R/W	13	R/W
Start						+15…30 V		1	H	1
Stop					(0)	0 V		0	L	0
MONITOR \ Measurements \ Speed \ Speed in DRC [ ]										
Ramp ref (d)	109	I16	-32768	+32767	-	(A)	Yes	R	-	R
Ramp output (d)	112	I16	-32768	+32767	-		Yes	R	-	R
Speed ref (d)	115	I16	-32768	+32767	-	(A)	Yes	R	-	R
Actual spd (d)	119	I16	-32768	+32767	-		Yes	R	-	R
F act spd (d)	925	I16	-32768	+32767	-	(A)	Yes	R	-	R
Act spd filter [s]	923	Float	0.001	1.000	0.100		Yes	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in rpm										
Ramp ref (rpm)	110	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Ramp outp (rpm)	113	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Speed ref (rpm)	118	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Actual spd (rpm)	122	I16	-8192	+8192	-		Yes	R	QA	R
Enc 1 speed (rpm)	427	I16	-8192	+8192	-		Yes	R		R
Enc 2 speed (rpm)	420	I16	-8192	+8192	-		Yes	R		R
F act spd (rpm)	924	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Act spd filter [s]	923	Float	0.001	1.000	0.100		Yes	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in %										
Ramp ref (%)	111	Float	-200.0	+ 200.0	-	(A)	Yes	R	-	-
Ramp output (%)	114	Float	-200.0	+ 200.0	-		Yes	R	-	-
Speed ref (%)	117	Float	-200.0	+ 200.0	-	(A)	Yes	R	-	-
Actual spd (%)	121	Float	-200.0	+ 200.0	-		Yes	R	-	-
MONITOR \ Measurements										
Mains voltage [V]	466	U16	0	999	-	(A)	Yes	R	-	-
Mains frequency [Hz]	588	Float	0.0	70.0	-		Yes	R	-	-
Output power [Kw]	1052	Float	0.01	9999.99	-		Yes	R	-	-
Output voltage [V]	233	Float **	0	999	-	(A)	Yes	R	QA	R
Motor current [%]	199	I16	-250	250	-	(A)	Yes	R	QA	R
F T curr (%)	928	I16	-500	+500	-	(A)	Yes	R	QA	R
T curr filter [s]	926	Float	0.001	0.250	0.100		Yes	R/W	-	-
T current ref [%]	41	I16	-200	+200	-	(A)	Yes	R	QA	R
Flux reference [%]	500	Float	0.0	100.0	-	(A)	Yes	R	QA	-
Flux current [%]	234	Float *	0.0	100.0	-	(A)	Yes	R	QA	R
Flux current (A)	351	Float	0.1	99.9	S		Yes	R	-	-
MONITOR \ I/O										
Digital I/Q					-		Yes	-	-	-
Dig input term	564	U16	0	65535	-		-	R	-	R
Dig input term 1	565	U16	0	1	-		-	R	-	R
Dig input term 2	566	U16	0	1	-		-	R	-	R
Dig input term 3	567	U16	0	1	-		-	R	-	R
Dig input term 4	568	U16	0	1	-		-	R	-	R
Dig input term 5	569	U16	0	1	-		-	R	-	R
Dig input term 6	570	U16	0	1	-		-	R	-	R
Dig input term 7	571	U16	0	1	-		-	R	-	R
Dig input term 8	572	U16	0	1	-		-	R	-	R
Dig input term 9	573	U16	0	1	-		-	R	-	R
Dig input term 10	574	U16	0	1	-		-	R	-	R
Dig input term 11	575	U16	0	1	-		-	R	-	R
Dig input term 12	576	U16	0	1	-		-	R	-	R
Dig input term 15	579	U16	0	1	-		-	R	-	R
Dig input term 16	580	U16	0	1	-		-	R	-	R
Dig output term	581	U16	0	65535	-			R	-	R
Virtual dig inp	582	U16	0	65535	-		Yes	R	-	-
Virtual dig out	583	U16	0	65535	-		Yes	R	-	-

(A) = This parameter may be assigned to a programmable analogue output.

5.3 Monitor

MONITOR

The MONITOR menu shows all the analog reference values for the current and the real values, and the status of digital inputs/outputs. The values referring to speed are given in tr/mn, as a % (referring to Speed base value) and in the dimension specified for the factor function.

Enable drive When the DC drive is controlled via the keyboard, it is enabled via the **Enable drive** parameter. Terminal 12 also needs to be enabled. The Start command is required to start the drive.

Enabled	DC drive unlocked
Disabled	DC drive locked

Start/Stop Whether the DC drive is Running or Stopped.

Ramp ref (d) Total ramp input reference value in the units specified by the factor function.

Ramp ref (tr/mn) Total ramp input reference value in tr/mn.

Ramp ref (%) Total ramp input reference value as a % of **Speed base value.**

Ramp output (d) Ramp output, in the units specified by the factor function.

Ramp outp (tr/mn) Ramp output in tr/mn.

Ramp output (%) Ramp output as a % of **Speed base value**.

Speed ref (d) Total analog reference value for the speed in the units specified by the factor function.

Speed ref (tr/mn) Total analog reference value for the speed in tr/mn.

Speed ref (%) Speed analog reference value as a % of **Speed base value**.

Actual spd (d) Actual speed, in the units specified by the factor function.

Actual spd (tr/mn) Actual speed in tr/mn.

Actual spd (%) Actual speed as a % of **Speed base value**.

F act spd (d) Filtered value of actual speed in the units specified by the factor function.

F act spd (tr/mn) Filtered value of actual speed in tr/mn.

Act spd filter Time constant of the first order of the bottom-line over actual Speed.

Enc 2 speed (rpm) Actual speed measured by encoder 2.
This parameter is only accessible when **Speed fbk sel** = encoder 2.

Mains voltage Mains voltage in V.

Mains frequency Mains frequency in Hz.

Output power Output power in kW.

Output voltage Armature voltage in Volts.

Motor current Armature current as a % of **Full load curr**.

F T curr (%) Filtered value as a % of **Torque current**.

T curr filter Bottom-line filter of the first order on **Torque current** parameter.

T current ref Total current analog reference value as a % of **Full load current**.

5.3 Monitor

MONITOR

Flux reference Field excitation current reference as a % of **Motor nom flux**.

Flux current Field excitation current as a % of **Motor nom flux**.

Flux current (A) Field excitation current expressed in amperes.

Digital I/O Displays digital input/output values of the DC drive and the DCVS5V62 board.

Display: I 1 2 3 4 5 6 7 8 E S F
Q 1 2 3 4 5 6 7 8

The inputs and outputs displayed are the ones which are enabled.
E = Enable drive (terminal 12)
S = Start (terminal 13)
F = Fast stop (terminal 14)

When a serial link or CANopen is used, the status of digital inputs/outputs can be read using the parameters **Dig input term** and **Dig output term**.

Dig input term Status of digital inputs of the product and the optional DCVS5V62 board to be read via the serial link or CANopen. The information is contained in a word where each bit is 1 and if there is any voltage to the corresponding terminal.

Bit n.	inputs	Bit n.	control inputs
0	terminal 21 (digital input 1)	8	terminal 12 (Enable drive)
1	terminal 22 (digital input 2)	9	terminal 13 (Start)
2	terminal 23 (digital input 3)	10	terminal 14 (Fast stop)
3	terminal 24 (digital input 4)		
4	DCVS5V62, terminal 11 (digital input 5)		
5	DCVS5V62, terminal 12 (digital input 6)		
6	DCVS5V62, terminal 13 (digital input 7)		
7	DCVS5V62, terminal 14 (digital input 8)		

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Dig input term 1* Status of digital 1 input (terminal 31)
Dig input term 2* Status of digital 2 input (terminal 32)
Dig input term 3* Status of digital 3 input (terminal 33)
Dig input term 4* Status of digital 4 input (terminal 34)
Dig input term 5* Status of digital 5 input (terminal 11, DCVS5V62 board)
Dig input term 6* Status of digital 6 input (terminal 12, DCVS6V62 board)
Dig input term 7* Status of digital 7 input (terminal 13, DCVS7V62 board)
Dig input term 8* Status of digital 8 input (terminal 14, DCVS8V62 board)
Dig input term 9* Status of digital input terminal 12 (Enable drive)
Dig input term 10* Status of digital input terminal 13 (Start)
Dig input term 11* Status of digital input terminal 14 (Fast stop)

Dig input term 12* Not used

5.3 Monitor

MONITOR

Dig input term 13* Not used
Dig input term 14* Not used
Dig input term 15* Not used
Dig input term 16* Not used

Dig output Status of digital outputs on the product and the optional DCVS5V62 board to be read via the serial link or CANopen.

The information is contained in a word where each bit is 1 if the corresponding terminal is enabled

Bit n.	outputs	Bit n.	outputs
0	terminal 26 (digital output 1)	4	DCVS5V62, terminal 6 (digital output 5)
1	terminal 27 (digital output 2)	5	DCVS5V62, terminal 7 (digital output 6)
2	terminal 28 (digital output 3)	6	DCVS5V62, terminal 8 (digital output 7)
3	terminal 29 (digital output 4)	7	DCVS5V62, terminal 9 (digital output 8)

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Virtual dig inp Status of virtual digital inputs **
Virtual dig out Status of virtual digital outputs **

* Available only via the serial link or CANopen.
** Virtual inputs/outputs are only used in conjunction with a bus interface, to provide faster communications. For further details, please consult the bus interface manual.

5.4 Variable inputs

VARIABLE INPUTS Ramp reference, speed reference, current reference

DCVN-series DC drives allow ramp input reference values for the ramp and the speed regulator to be set in different dimensions:
- as a % of **Speed base value**
- in a unit which the user may define using the factor function, e.g. speed m/s. The default value for the unit is tr/mn.

The two systems of units are linked, i.e. the modification of one system will cause the modification of the other.

E.g.:
A motor at a maximum speed of 1500 rpm. This is 100% and at the same time the value defined by the user is 10,000 bottles/hour (see 5.11.6).
Changing the analog reference value to 50% will automatically change the other value to 5,000 bottles/hour.

The table below shows the interaction between the different analog reference values. If changes are made, the other parameters are automatically overwritten.

Parameter with the same value	N.	Dimensions
Ramp ref 1	44	according to function factor
Ramp ref 1 (%)	47	%
Ramp ref 2	48	according to function factor
Ramp ref 2 (%)	49	%
Speed ref 1	42	according to function factor
Speed ref 1 (%)	337	%
Speed ref 2	43	according to function factor
Speed ref 2 (%)	338	%

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5.4 Variable inputs

VARIABLE INPUTS

5.4.1 Ramp references (Ramp ref)

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
INPUT VARIABLES \ Ramp ref \ Ramp ref 1										
Ramp ref 1	44	I16	-2 * P45	+2 * P45	0	Analog inp.1	Yes	R/W	IA, QA	R/W
Ramp ref 1 (%)	47	Float	-200.0	+200.0	0	(Terminals 1+2) (B)	Yes	R/W	-	-
INPUT VARIABLES \ Ramp ref \ Ramp ref 2										
Ramp ref 2	48	I16	-2 * P45	+2 * P45	0	(B)	Yes	R/W	IA, QA	R/W
Ramp ref 2 (%)	49	Float	-200.0	+200.0	0		Yes	R/W	-	-

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
MONITOR \ Measurements \ Speed \ Speed in DRC [ ]										
Ramp ref (d)	109	I16	-32768	+32767	-	(A)	Yes	R	-	R
Ramp output (d)	112	I16	-32768	+32767	-		Yes	R	-	R
Speed ref (d)	115	I16	-32768	+32767	-	(A)	Yes	R	-	R
Actual spd (d)	119	I16	-32768	+32767	-		Yes	R	-	R
F act spd (d)	925	I16	-32768	+32767	-	(A)	Yes	R	-	R
Act spd filter [s]	923	Float	0.001	1.000	0.100		Yes	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in rpm										
Ramp ref (rpm)	110	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Ramp outp (rpm)	113	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Speed ref (rpm)	118	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Actual spd (rpm)	122	I16	-8192	+8192	-		Yes	R	QA	R
Enc 1 speed (rpm)	427	I16	-8192	+8192	-		Yes	R		R
Enc 2 speed (rpm)	420	I16	-8192	+8192	-		Yes	R		R
F act spd (rpm)	924	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Act spd filter [s]	923	Float	0.001	1.000	0.100		Yes	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in %										
Ramp ref (%)	111	Float	-200.0	+ 200.0	-	(A)	Yes	R	-	-
Ramp output (%)	114	Float	-200.0	+ 200.0	-		Yes	R	-	-
Speed ref (%)	117	Float	-200.0	+ 200.0	-	(A)	Yes	R	-	-
Actual spd (%)	121	Float	-200.0	+ 200.0	-		Yes	R	-	-

(A) = This parameter may be assigned to a programmable analogue output.
(B) = This parameter may be assigned to another analogue input.
P.45 = **Speed base value**. Must not exceed 8192.

The ramp input reference value gives the speed the drive must attain, after the acceleration stage. Changes to the ramp input reference value are therefore transferred to the ramp. As regards 4-quadrant DC drives (DCVN104), the direction of rotation is determined by the polarity (+/-) of the reference.

Note! Two-quadrant DCVN94 DC drives only accept positive analog reference values. Negative values are disregarded!

VARIABLE INPUTS

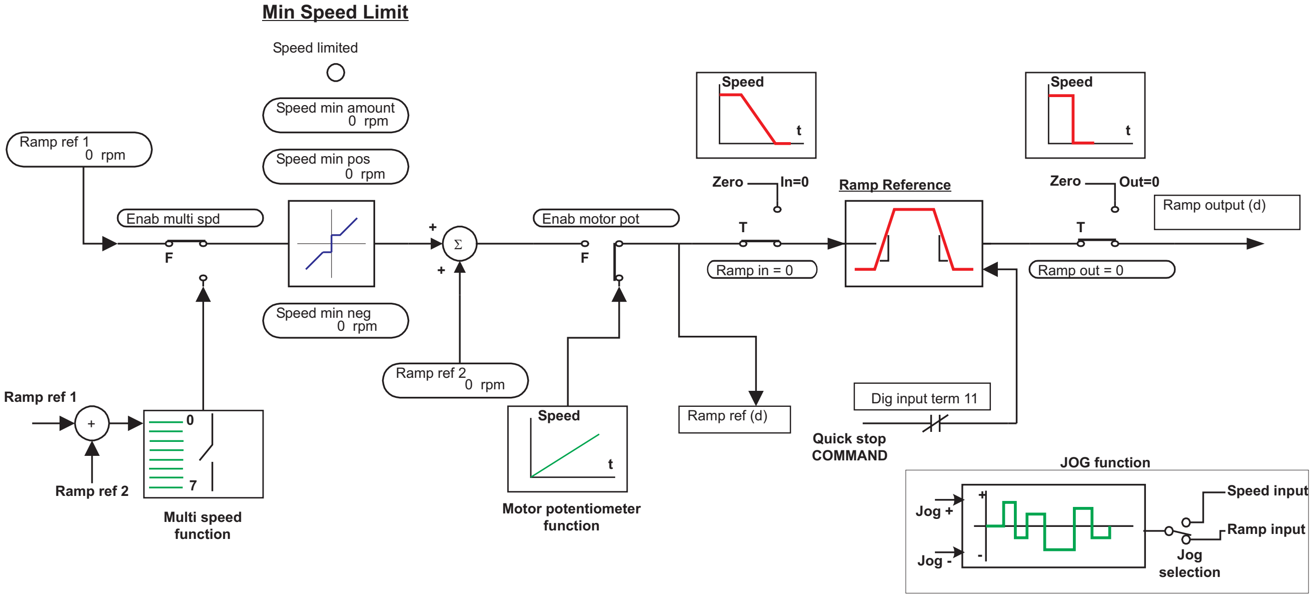


Figure 5.4.1.1: Ramp references

Ramp ref 1	1st ramp input reference. The value to be entered depends on the factor function.
Ramp ref 1 (%)	1st ramp input reference value as a % of **Speed base value**.
Ramp ref 2	2nd ramp input reference. The value to be entered depends on the factor function.
Ramp ref 2 (%)	2nd ramp input reference as a % of **Speed base value**.
Ramp ref (tr/mn)	Total ramp input reference value for the ramp in tr/mn.
Ramp ref (d)	Total ramp input reference value in the dimension specified by the factor function.
Ramp ref (%)	Total ramp input reference value as a % of **Speed base value**.

The total ramp input reference value **Ramp ref** is the sum of **Ramp ref 1** and **Ramp ref 2**.

Example 1: **Ramp ref 1** = + 50 % **Ramp ref 2** = + 30 %
Ramp ref = 50 % + 30 % = 80 %

Example 2: **Ramp ref 1** = + 40 % **Ramp ref 2** = - 60 %
Ramp ref = 40% - 60% = -20%

The signals 0 ... 10 V, 0 ... 20 mA- and 4 ... 20 mA can be used as references. Single polarity current references can only be used with 2-quadrant DC drives.

Ramp ref (tr/mn), **Ramp ref (d)** and **Ramp ref (%)** are affected by minimal speed limitations. These are directly applied to **Ramp ref 1**, and the motorised potentiometer references and **Multispeed** references.

VARIABLE INPUTS

5.4.2 Speed reference (Speed ref)

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
INPUT VARIABLES \ Speed ref \ Speed ref 1										
Speed ref 1	42	I16	-2 * P45	+2 * P45	0	Ramp output (C)	Yes	R/W	IA, QA	R/W
Speed ref 1 (%)	378	Float	-200.0	+200.0	0		Yes	R/W	-	-
INPUT VARIABLES \ Speed ref \ Speed ref 2										
Speed ref 2	43	I16	-2 * P45	+2 * P45	0	(C)	Yes	R/W	IA, QA	R/W
Speed Ref 2 (%)	379	Float	-200.0	+200.0	0		Yes	R/W	-	-

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
MONITOR \ Measurements \ Speed \ Speed in DRC [ ]										
Ramp ref (d)	109	I16	-32768	+32767	-	(A)	Yes	R	-	R
Ramp output (d)	112	I16	-32768	+32767	-		Yes	R	-	R
Speed ref (d)	115	I16	-32768	+32767	-	(A)	Yes	R	-	R
Actual spd (d)	119	I16	-32768	+32767	-		Yes	R	-	R
F act spd (d)	925	I16	-32768	+32767	-	(A)	Yes	R	-	R
Act spd filter [s]	923	Float	0.001	1.000	0.100		Yes	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in rpm										
Ramp ref (rpm)	110	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Ramp outp (rpm)	113	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Speed ref (rpm)	118	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Actual spd (rpm)	122	I16	-8192	+8192	-		Yes	R	QA	R
Enc 1 speed (rpm)	427	I16	-8192	+8192	-		Yes	R		R
Enc 2 speed (rpm)	420	I16	-8192	+8192	-		Yes	R		R
F act spd (rpm)	924	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Act spd filter [s]	923	Float	0.001	1.000	0.100		Yes	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in %										
Ramp ref (%)	111	Float	-200.0	+ 200.0	-	(A)	Yes	R	-	-
Ramp output (%)	114	Float	-200.0	+ 200.0	-		Yes	R	-	-
Speed ref (%)	117	Float	-200.0	+ 200.0	-	(A)	Yes	R	-	-
Actual spd (%)	121	Float	-200.0	+ 200.0	-		Yes	R	-	-

(A) = This parameter may be assigned to a programmable analogue output.
(C) = This parameter may be assigned to a programmable analogue input.
P.45 = **Speed base value**. Must not exceed 8192.

The speed reference value defines the required speed for the drive. The drive responds directly to the progression of the reference value, except where available torque is insufficient, when the DC drive is working in current limitation mode.
The speed reference determines the speed of the motor, whereas the +/- signs determine the direction of rotation.

Note! Two-quadrant DCVN94 DC drives only accept positive reference values. Negative values are disregarded!

5.4 Variable inputs

VARIABLE INPUTS

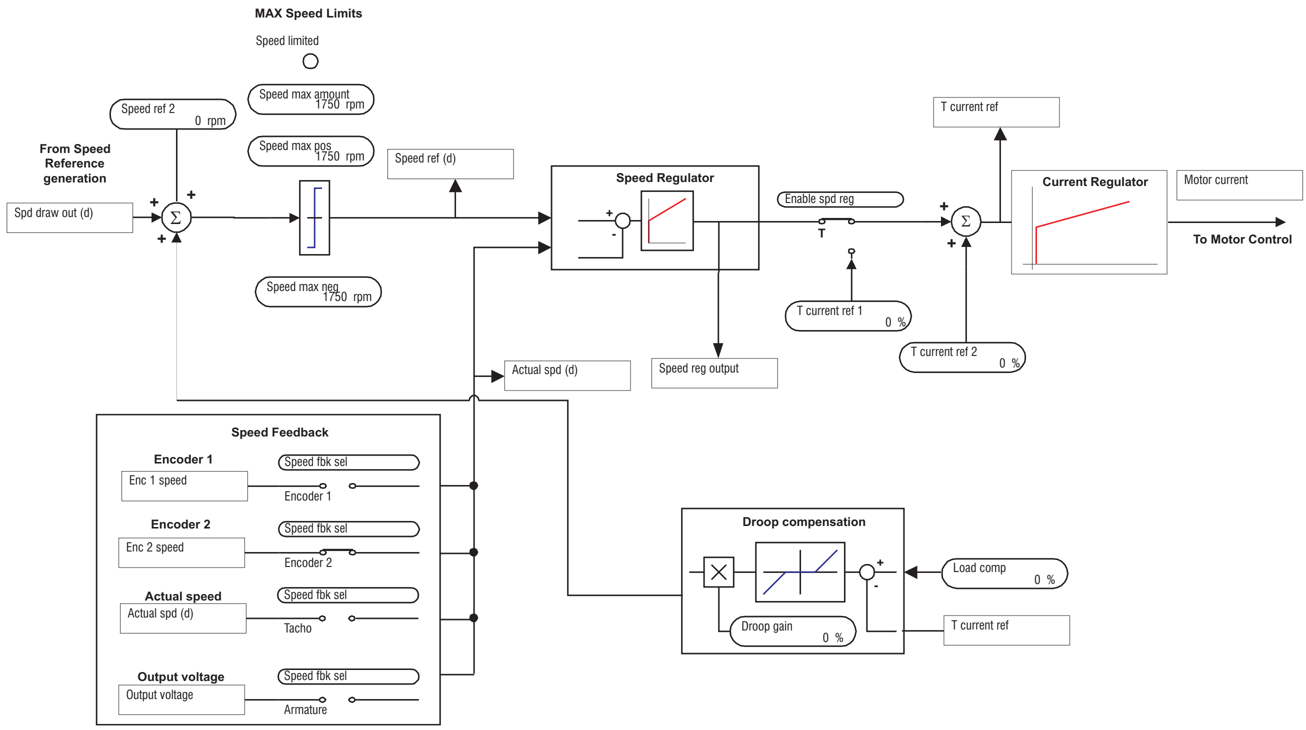


Figure 5.4.2.1: Speed reference

Speed ref 1	1st speed reference value. The value to be entered depends on the factor function.
Speed ref 1 (%)	1st. speed reference value as a % of **Speed base value**.
Speed ref 2	2nd. speed reference value. The value to be entered depends on the factor function.
Speed ref 2 (%)	2nd. speed reference value as a % of **Speed base value**.
Speed ref (rpm)	Total reference value for the speed in rpm.
Speed ref (d)	Total reference value in the size specified by the factor function.
Speed ref (%)	Total reference value as a % of **Speed base value**.

The total speed reference value is the sum of **Speed ref 1** and **Speed ref 2**.

The signals 0 ... 10 V, 0 ... 20 mA- and 4 ... 20 mA can be used as references. Single polarity current references can only be used with 2-quadrant DC drives.

If the ramp is selected, (**Enable ramp** parameter = Enabled), **Speed ref 1** input value is automatically linked to ramp output.

VARIABLE INPUTS

5.4.3 Torque reference (T current ref)

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
INPUT VARIABLES \ T current ref										
T current ref 1 [%]	39	I16	-200	+200	0	Speed regulator output (C)	Yes	R/W	IA, QA	R/W
T current ref 2 [%]	40	I16	-200	+200	0	(C)	Yes	R/W	IA, QA	-

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
CURRENT REGULAT										
T current ref [%]	41	I16	-200	+200	-	(A)	Yes	R	QA	R
Motor current [%]	199	I16	-250	250	-		Yes	R	QA	R
Arm resistance [ ]	453	Float	S	S	0.500		Yes	R/W	-	-
Arm inductance [mH]	454	Float	S	S	4.00		Yes	R/W	-	-
Current scale	1365	Float	0.3	2.0	1		Yes	R/W	-	-
E int [V]	587	I16	-80	+80	-	(A)	Yes	R	QA	-
R&L search	452	U16	0	1	OFF		Yes	R/Z	-	-
ON								1		
OFF					(0)			0		
Zero torque	353	U16	0	1	Not active (1)	(E)	Yes	R/W	ID	R/W
Not active								1	H	
Active								0	L	

(A) = This parameter may be assigned to a programmable analogue output.
(C) = This parameter may be assigned to a programmable analogue input.

The current reference value is proportional to the motor armature current and determines torque. The polarity (+/-) determines torque direction. In most applications, **T current Ref 1** comes from speed controller output. **T current ref 2** can also be used as a correction value.

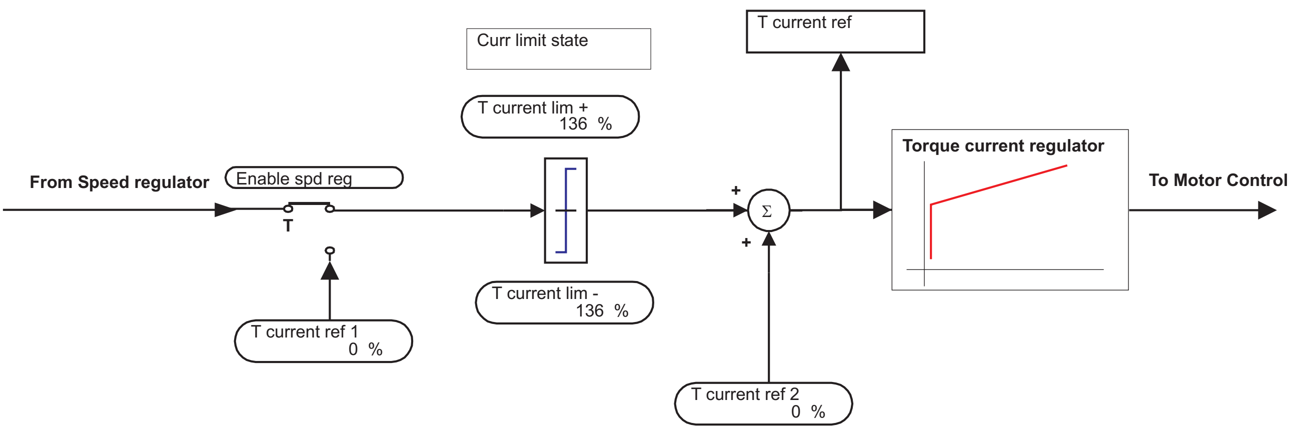


Figure 5.4.3.1: Torque reference.

5.4 Variable inputs

VARIABLE INPUTS

T current ref 1 — 1st. Reference value as a % of **Full load curr**. The maximum value depends on the **Enable overload** parameter.

Enable overload	Disabled	**T current ref 1**	100 % max
Enable overload	Enabled	**T current ref 1**	150% max

T current ref 2 — 2nd. current reference value. Input as a % of **Full load curr**. The maximum value depends on the **Enable overload** parameter.

Enable overload	Disabled	**T current ref 2**	100 % max
Enable overload	Enabled	**T current ref 2**	150% max

Current scale — This parameter allows to change **Full load curr** parameter from 30% to 200% of its value.

T current Ref — Total reference value as a % of **Full load curr**.

The total current reference value is the sum of **T current ref 1** and **T current ref 2**.

Example 1: **T current ref 1** = + 50 % **T current ref 2** = + 30 %

T current ref = 50 % + 30 % = 80 %

Example 2: **T current ref 1** = + 40 % **T current ref 2** = - 60 %

T current ref = 40 % - 60 % = - 20 %

The signals 0 ... 10 V, 0 ... 20 mA, et 4 ... 20 mA can be used as references. Single polarity current references can only be used with 2-quadrant DC drives.

LIMITS	Speed limits, current limits, excitation current limits

5.5.1 Speed limits

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
LIMITS \ Speed limits \ Speed amount										
Speed min amount	1	U32	0	2^{32}-1	0		Yes	R/Z	-	-
Speed max amount	2	U32	0	2^{32}-1	5000		Yes	R/Z	-	-
LIMITS \ Speed limits \ Speed min/max										
Speed min pos	5	U32	0	2^{32}-1	0		Yes	R/Z	-	-
Speed max pos	3	U32	0	2^{32}-1	5000		Yes	R/Z	-	-
Speed min neg	6	U32	0	2^{32}-1	0		Yes	R/Z	-	-
Speed max neg	4	U32	0	2^{32}-1	5000		Yes	R/Z	-	-
Speed limited	372	U16	0	1		(D)	-	R	QD	R
Speed limited								1	H	1
Speed not limited								0	L	0

(D) = This parameter can be assigned to a programmable digital output.

Speed min amount Defines minimum speed in both directions of rotation (DCVN104). Any value lower than this minimum is disregarded, whatever the selected reference value. This parameter observes ramp input. (see fig. 5.4.1.1) If the parameter **Speed min amount** is changed, the parameters **Speed min pos** and **Speed min neg** are set to the same value. If either of these parameters is later changed, the last change is the valid one. The value to be entered depends on the factor function.

Speed max amount Defines maximum speed in both directions of rotation (DCVN104). This parameter limits speed controller input and takes into account both the reference values from the ramp and slip compensation (see fig. 5.4.2.1) If the parameter **Speed max amount** is changed, the parameters **Speed max pos** and **Speed max neg** are set to the same value. If either of these values is later changed, the last change is the valid one. The value to be entered depends on the factor function.

Speed min pos Defines minimum speed of clockwise rotation of the motor. Any value lower than this minimum is disregarded, whatever the selected reference value. This function affects ramp input. The value of the parameter to be entered depends on the factor function.

Speed max pos Defines the maximum speed of clockwise rotation of the motor. This function affects speed controller input and therefore takes into account both the reference values from the ramp and the direction of rotation. The value of the parameter to be entered depends on the factor function.

Speed min neg Defines minimum speed of anti-clockwise rotation of the motor (DCVN104). Any value lower than this minimum is disregarded, whatever the selected reference value. This parameter affects ramp input. The value of this input parameter is based on the factor function.

Speed max neg Defines maximum speed of anti-clockwise rotation of the motor (DCVN104). This parameter affects speed controller input and therefore takes into account both the reference values from the ramp and the direction of rotation. The value of this input parameter is based on the factor function.

5.5 Limits

LIMITS

Speed limited

Message indicating that the reference value is limited by the minimum and maximum values input.

Status 1	Reference value limited by input value is outside the value limits set.
Status 0	Reference value found within limits of values set.

Note! The parameters **Speed min amount**, **Speed min pos** and **Speed min neg** affect the reference value **Ramp ref 1**, motorised potentiometer operation and the multi-speed function. However, they have no effect on the parameter **Ramp ref 2**.

LIMITS

5.5.2 Current limits

The torque limitation operating on speed controller output (see fig. 5.4.3.1).

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	RS	Term	D/P
LIMITS \ Current limits										
T current lim type T lim mot gen T lim +/-	715	U16	0	1	0		Yes	R/Z 1 0	-	-
T current lim [%]	7	U16	0	200	100	(E)	Yes	R/W	IA	R/W
T current lim + [%]	8	U16	0	200	100	(E)	Yes	R/W	IA	R/W
T current lim - [%]	9	U16	0	200	100	(E)	Yes	R/W	IA	R/W
Curr limit state Curr. limit reached Curr. limit not reached	349	U16	0	1		Digital output 5 (D)	-	R 1 0	QD H L	R 1 0
In use Tcur lim+ [%]	10	U16	0	200			Yes	R	-	R
In use Tcur lim- [%]	11	U16	0	200			Yes	R	-	R
Current lim red [%]	13	U16	0	200	100		Yes	R/W	-	R/W
Torque reduct Active Not active	342	U16	0	1	Not active (0)	(E)	Yes	R/W 1 0	ID H L	R/W 1 0

(D) = This parameter can be assigned to a programmable digital output.
(C) = This parameter may be assigned to a programmable digital input.

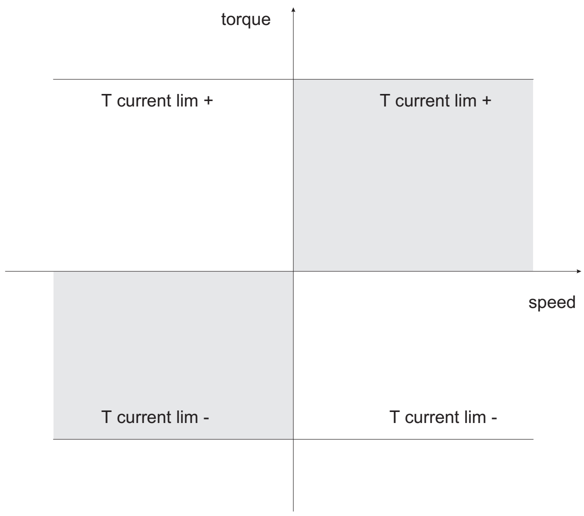


Figure 5.5.2.1: Torque limitations with T curr lim type = T lim +/-.

T curr lim type This parameter determines how the DC drive will work with current limitations.

T lim +/- The active positive torque limitation is **T current lim+** and the active negative torque limitation is **T current lim-**.

LIMITS

T lim mot/gen :
1- If motor speed is > +1% of **Motor max speed**, active negative torque limitation is **T current lim-**.
2- If motor speed is < -1% of **Motor max speed**, active positive torque limitation is **T current lim-** and active negative torque limitation is **T current lim +**.
3- Between -1% and +1% of **Motor max speed** is the value given to the parameter **T current lim+** which controls the direction of rotation.

T current lim

Symmetrical current limitation for both directions of rotation for DCVN104 DC drives. Defined as a % of the parameter **Full load curr**. The maximum value depends on the **Enable overload** parameter.

Enable overload	Disabled	**T current limit :** 100%
Enable overload	Enabled	**T current limit** : 150%

If the parameter **T current limit** is changed, the parameters **T current lim +** and **T current lim -** are set to the same value. If these two parameters are later changed, the last change is the valid one.

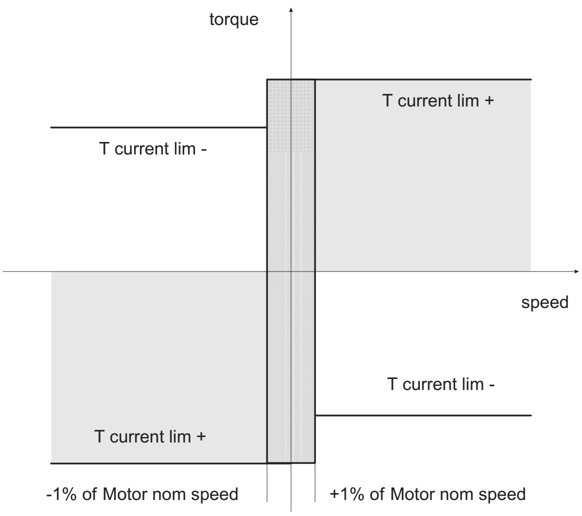


*Figure 5.5.2.2: Torque limitations with **T curr lim type** = T lim mot/gen*

T current lim +

Limitation of DC drive current by positive torque (motor rotating clockwise and braking anti-clockwise). Defined as a % of the parameter **Full load curr**. The maximum value depends on the **Enable overload** parameter.

T current lim -

Limitation of DC drive current by negative torque (motor rotating anti-clockwise and braking clockwise). Defined as a % of the parameter **Full load curr**. The maximum value depends on the **Enable overload** parameter. This parameter is not enabled for DCVN94 DC drives.

Curr limit state

Status message, indicating whether the DC drive is operating with current limitations or not.

Status 1	DC drive operating with current limitations. (Diode «I_{lim}» lit)
Status 0	DC drive not operating with current limitations.

LIMITS

In use Tcur lim + Status message indicating current limitation value **Tcur lim +** used.

In use Tcur lim - Status message indicating the current limitation value **Tcur lim -** used by the negative torque direction as a % of **Full load curr**.

Torque reduct Validation of torque reduction. This function can be assigned to a digital input. When the torque reduction function is active, the limit of current changes in accordance with the % set for the parameter **Current lim red**.

Status 1 (Disabled) Torque reduction enabled

Status 0 (Enabled) Torque reduction disabled

Current lim red % of **T current lim +/-** enabled by the **Torque reduct** function. If the overload controller (Enable Overload = Enable) is enabled, the maximum value of **Current lim red** is equal to 150% if not, it may not exceed 100%.

Example of this function and the **Current lim red** and **Torque reduct** parameters.

T current limit (or **T current lim +/-**) = 80 %
Current lim red = 70 %
Torque reduct = Status 1 (Enabled) **Current limit** = 80 %
Torque reduct = Status 0 (Disabled) **Current limit** = 50 % (70 % of 80 %)

The value for T current limit can be set in the START UP\Limits menu.

5.5.3 Flux limits

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
LIMITS \ Flux limits										
Flux current max [%]	467	U16	P468	100	100	(A), (C)	Yes	R/W	-	R/W
Flux current min [%]	468	U17	0	P467	5		Yes	R/W	-	----

(A) = This parameter may be assigned to a programmable analogue output.
(C) = This parameter may be assigned to a programmable analogue input.

Flux current max % of maximum flux on the basis of the **Motor nom flux** parameter.

The maximum value (100%) corresponds the motor inducer circuit working with a current equal to the value set in **Motor nom flux**.

If no curve is defined for the **I field cnst** parameters, variation of the excitation current is proportional to the value of this parameter.

(see Flux /if curve paragraph 4.6.4.1)

Flux current min % of minimum flux on the basis of the **Motor nom flux** parameter.

The value causes a minimum current in relation to the value set in **Motor nom flux** to circulate in the motor field circuit.

The value programmed here affects the threshold for giving off a «Field loss» alarm. The threshold is equal to one half of **Flux current min**.

5.6 Ramp

RAMP Acceleration, deceleration, quick stop, S-ramp, ramp freezing

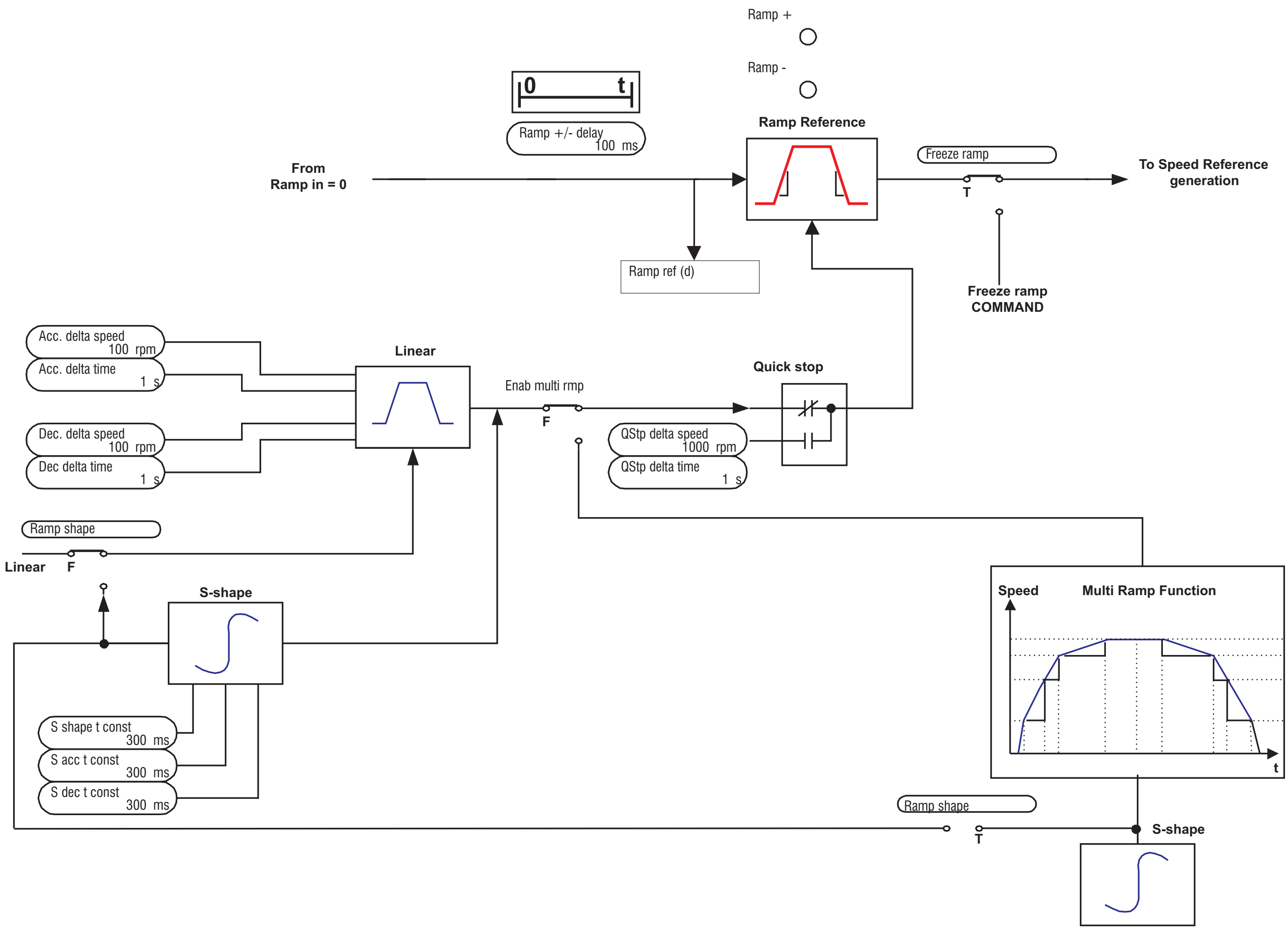


Figure 5.6.1: Ramp circuit.

The ramp (reference value integrator) determines the acceleration and deceleration times of the DC drive. These times can be set separately.

An additional ramp is supplied for fast-stop.

The ramp may be linear or in an S-shape.

The reference values can be defined in different ways
- with the reference values **Ramp ref 1** and/or **Ramp ref 2**
- using the multi-speed function
- using the motorised potentiometer function
- using the Jog function.

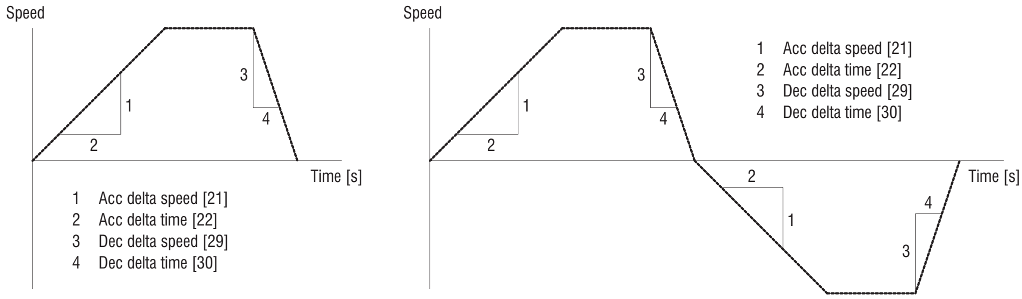
The ramp generator can be used as a standalone. When the ramp generator is disabled (**Enable ramp** = disabled), the commands **Enable drive**, **Start/Stop** and **Fast stop** do not affect the ramp generator. As such, it can operate freely and be used separately.

5.6 Ramp

RAMP

5.6.1 Acceleration, Deceleration, Fast stop

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
RAMP \ Acceleration										
Acc delta speed	21	U32	0	2^{32}-1	100		Yes	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1		Yes	R/W	-	-
RAMP \ Deceleration										
Dec delta speed	29	U32	0	2^{32}-1	100		Yes	R/W	-	-
Dec delta time [s]	30	U16	0	65535	1		Yes	R/W	-	-
RAMP \ Quick stop										
QStp delta speed	37	U32	0	2^{32}-1	1000		Yes	R/W	-	-
QStp delta time [s]	38	U16	0	65535	1		Yes	R/W	-	-



DCVN94 DCVN104

Figure 5.6.1.1: Acceleration and deceleration ramps.

Acc delta speed Increases acceleration speed using the same unit as the ramp reference and is based on the factor function.

Acc delta time Increases acceleration times, defined in seconds. If this parameter is set to 0 seconds, ramp output directly follows the reference value.

Dec delta speed Deceleration speed decreases.

Dec delta time Deceleration time increases.

Qstp delta speed Deceleration speed decreases in fast-stop mode.

Qstp delta time Deceleration time increases in fast-stop mode.

Quick stop Enables the Quick stop ramp.

DC drive acceleration is defined as a ratio of the **Acc delta speed** and **Acc delta time** parameters (see diagram 5.6.1.1). As regards 4-quadrant DC drives (DCVN104), the same is true for both motor rotation directions.
DC drive deceleration is defined as a ratio of the **Dec delta speed** and **Dec delta time** parameters.
The Quick-Stop function allows for a second deceleration ramp to fast-stop the DC drive. In this case, ramp output is not set to zero immediately, but after a defined interval. Drive deceleration via the Quick Stop function is defined as a ratio of the **Qstp delta speed** and **Qstp delta time** parameters. This ramp is enabled by the **Fast stop** and **Quick stop** functions and only works with 4-quadrant DC drives.

5.6 Ramp

RAMP

5.6.2 Shapes of the ramps and command signal

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	RS	Term	D/P
RAMP										
Ramp shape S-Shaped Linear	18	U16	0	1	Linear 0		Yes	R/Z 1 0	-	-
S shape t const [ms]	19	Float	100	3000	300		Yes	R/W	-	-
S acc t const [ms]	663	Float	100	3000	300		Yes	R/W	-	-
S dec t const [ms]	664	Float	100	3000	300		Yes	R/W	-	-
Ramp +/- delay [ms]	20	U16	0	65535	100		Yes	R/W	-	-
Fwd-Rev No direction Fwd direction Rev direction No direction	673	U16	0	3	1		Yes	R/W 0 1 2 3	ID	R/W 0 1 2 3
Forward sign	293	U16	0	1	0		-	R/W	ID	R/W
Reverse sign	294	U16	0	1	0		-	R/W	ID	R/W
Enable ramp Enabled Disabled	245	I16	0	1	Enabled (1)		Yes	R/Z 1 0	-	-
Ramp out = 0 Not active Active	344	U16	0	1	Not active (1)	(E)	Yes	R/W 1 0	ID H L	R/W 1 0
Ramp in = 0 Not active Active	345	U16	0	1	Not active (1)	(E)	Yes	R/W 1 0	ID H L	R/W 1 0
Freeze ramp Not active Active	373	U16	0	1	Not active (1)	(E)	Yes	R/W 1 0	ID H L	R/W 1 0
Ramp + Acc.CW+Dec.antiCW Other states	346	U16	0	1	-	Digital output 1 (E)	-	R 1 0	QD H L	R 1 0
Ramp - Acc.anti CW+DecCW Other states	347	U16	0	1	-	Digital output 2 (E)	-	R 1 0	QD H L	R 1 0
Acc state Acc CW+Acc.antiCW Other states	1259	U16	0	1	-		-	R 1 0	QD H L	R 1 0
Dec state Dec CW+Dec.antiCW Other states	1260	U16	0	1	-		-	R 1 0	QD H L	R 1 0

(E) = This parameter may be assigned to a programmable digital input.

5.6 Ramp

RAMP

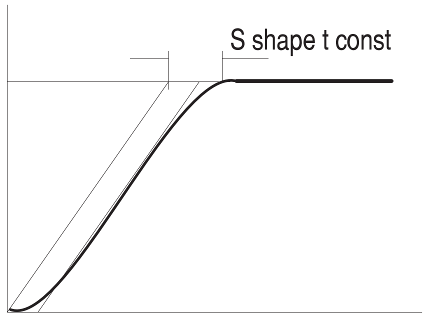


Figure 5.6.2.1: effect of the S shape t const parameter.

The parameters **Ramp shape** and **S shape t const** determine the shape of the ramp.

Ramp shape Linear Linear ramp
S shaped S-shaped ramp

S shape t const Determines the gradient of the curve for S-shaped ramps (see diagram 5.6.2.1).

S acc t const Determines the curve for S-shaped acceleration ramps.
S dec t const Determines the curve for S-shaped deceleration ramps.

When using very different **S acc t const** and **S dec t const** values, this provides discontinuous behaviour when changing the motor rotation direction.
The value of **S shape t constant** is added to the ramp times of linear ramps. Ramp time is thus extended by the value defined by the **S shape t const** parameter. This is true however wide a speed change may be required

Acceleration or deceleration statuses (= Active ramp) are indicated by the **Ramp** + and **Ramp -** parameters.

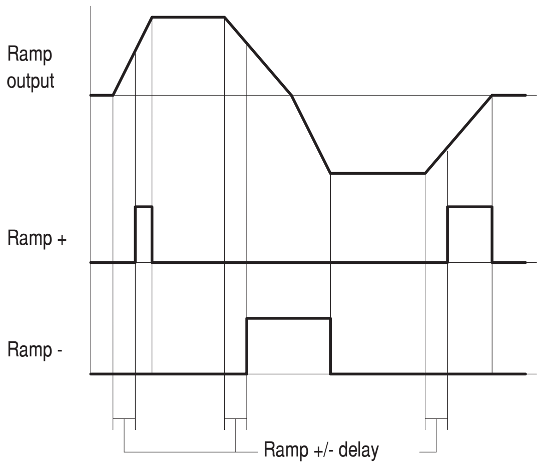


Figure 5.6.2.2: Ramp delay.

Ramp +/- delay Introduces a delay when enabling **Ramp +** and **Ramp -** information.

Fwd-Rev Changes the reference sign with a ramp. When the **Fwd** direction is requested, the ramp reference is multiplied by +1. When the **Rev** direction is requested, the ramp reference is multiplied by -1.

Forward sign Selects forward direction prior to the reference with ramp. Can be programmed on a digital input.

5.6 Ramp

RAMP

Reverse sign	Selects reverse direction prior to the reference with ramp. Can be programmed on a digital input.

When **Forward sign** and **Reverse sign** are both 0 or 1, the multiplier has a value of 0.

Ramp circuit behaviour is defined by the **Enable Ramp**, **Ramp In** = 0, **Ramp Out** = 0 and **Freeze ramp** parameters.

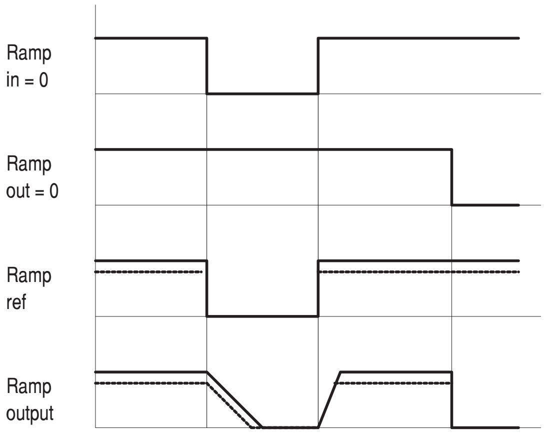


Figure 5.6.2.3: Ramp control.

Enable Ramp	This parameter can only be changed with the DC drive locked.	
	Enabled	The ramp is enabled
	Disabled	The ramp is disabled.
Ramp out = 0	Not active	Ramp output enabled.
	Active	Ramp output is immediately set to zero.
Ramp in = 0	Not active	Ramp input enabled. The **Ramp Ref** parameter corresponds to the reference set.
	Active	Ramp input disabled. **Ramp Ref** = 0.
Freeze ramp	Active	The output value of the ramp is maintained, whatever changes may occur in the input reference values.
	Not active	Ramp output follows changes to input reference values in accordance with the ramp times set.
Ramp +	Active if the DC drive is using positive torque (motor rotating clockwise and braking anti-clockwise).	
Ramp -	Active if the DC drive is using negative torque (motor rotating anti-clockwise and braking clockwise). Only applies to DCVN104.	

The DC drive will only work if the ramp is enabled. **Enable ramp** = Enabled.
When ramp input is enabled using **Ramp in** = 0, DC drive acceleration time starts. If input is disabled, the motor slows down after the deceleration time set until reaching zero speed.

When ramp output is set to zero using **Ramp out**=0, the product brakes with the maximum torque available. Braking is not possible with DCVN94 DC drives.

5.7 Speed regulator

SPEED REGULATOR Speed reg., speed zero logic, self-tuning, derivation, equalising functions

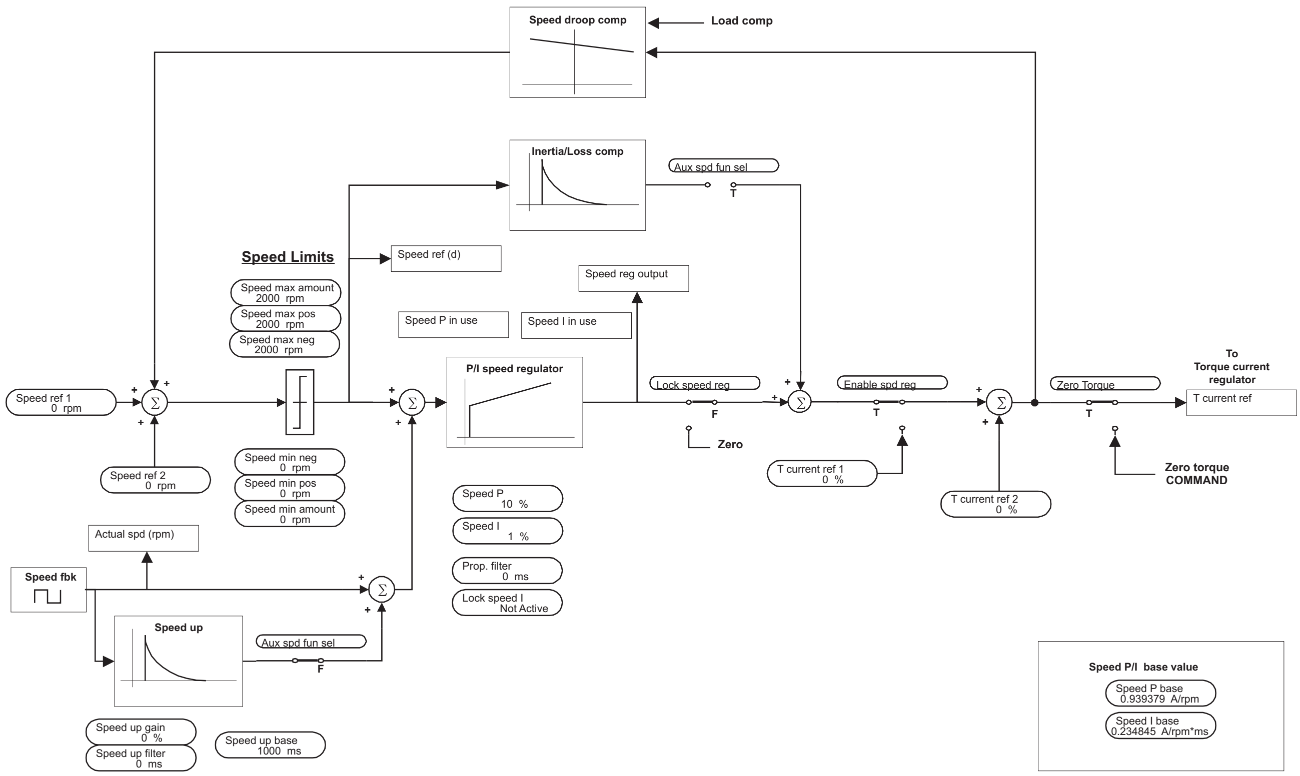


Figure 5.7.1: Diagram showing how the speed regulator works.

DCVN●●● -series DC drives are equipped with a speed regulator circuit which can be adapted easily to the requirements of the various applications. The product is factory set for PI tuning using the tuning parameters over the entire tuning range.

It can also perform the following functions:

- “Speed-up” to prevent oscillations during acceleration with strong inertia momentum.
- Speed zero logic for tuning when the motor is stopped.
- Adaptive speed regulator to optimise the regulator in accordance with actual speed or an external reference (**Adap. Reference**).
- On-the-fly restart of a working motor
- Speed signals
- Current balance function

SPEED REGULATOR

5.7.1 Speed regulator

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
SPEED REGULAT										
Speed ref [rpm]	118	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Speed reg output [%]	236	I16	-200	+200	-	T current ref (A)	Yes	R	QA	R
Lock speed reg ON OFF	322	U16	0	1	OFF (0)	(E)	Yes	R/W 1 0	ID H L	R/W 1 0
Enable spd reg Enabled Disabled	242	I16	0	1	Enabled (1)		Yes	R/Z 1 0	-	-
Lock speed I Not active Active	348	U16	0	1	Not active (1)	(E)	Yes	R/W 1 0	ID H L	R/W 1 0
Aux spd fun sel Inertia-loss cp Speed up	1016	U16	0	1	Speed up (0)	(E)	Yes	R/Z 1 0	-	-
Prop filter [ms]	444	U16	0	1000	0		Yes	R/W	-	-

(A) = This parameter may be assigned to a programmable analogue output.
(E) = This parameter may be assigned to a programmable digital input.

Speed ref Total reference value for the speed in tr/mn

Speed reg output Speed regulator output value, used as reference value for current controller.

Note! The speed regulator remains active, even when disabled. (Enable spd reg= Disabled), even when, in this condition, the **Speed reg output** parameter contains valid information. These data can be sent to the optional DCVS5W04 applications development and programming board to be used for other adjustments. If the speed regulator is active. (Enable spd reg = Enabled) the **Speed reg output** parameter contains the sum of real speed regulator output and the **T current ref 2** parameter.

Lock speed reg This parameter is used to block the speed regulator. When it is reached, it stops functioning, the current reference value is set to zero and the drive stops. The stopping time depends on the inertia and friction of the system in question. If the connection between the speed regulator and the current regulator is re-established, the DC drive re-starts on current limitation.

ON Speed regulator locked (= 0 V on digital input).

OFF Regulator not locked (= 15...30 V on digital input).

Enable spd reg This parameter can only be changed with the DC drive locked.

Enabled The speed regulator is enabled. Regulator output is connected to the current PID regulator input. **Speed reg output** = T current ref 1.

Disabled The speed regulator is disabled.

SPEED REGULATOR

Lock speed I — Disabled: Integral gain of the speed regulator enabled.
Enabled: Integral gain of the speed regulator disabled.

Aux spd fun sel — Selection of **Speed up** or **Inertia/loss cp** functions (see chapters 5.7.3. ***Speed* up** function and 5.7.5. ***Inertia/loss cp*** for more details).

Prop. filter — Time constant of the Derivative part of the Speed-up function.

The speed regulator must be enabled using the **Enable spd reg** parameter if it is to be used.
The speed regulator reference value is the sum of **Speed ref 1** and **Speed ref 2**.
Speed feedback can be provided by an encoder or a tachogenerator mounted on the drive shaft. The higher the resolution of the encoder (providing maximum frequency limits are observed), the more accurate the regulator control.
The regulator parameters can be set separately.

5.7.1.1 Self-tuning of the speed regulator

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
SPEED REGULAT. \ Self tuning										
Fwd-Rev spd tune	1029	U16	1	2	Fwd Direction (1)		Yes	R/Z	-	-
Fwd direction								1		
Rev direction								2		
Test T curr lim [%]	1048	U16	0	S	20		Yes	R/Z	-	-
Start	1027	U16	0	65535	-		Yes	C	-	-
Inertia [kg*m*m]	1014	Float	0.001	999.999	S		Yes	R/W	-	-
Inertia Nw [kg*m*m]	1030	Float	0.001	999.999	-		Yes	R	-	-
Friction [N*m]	1015	Float	0.000	99.999	S		Yes	R/W	-	-
Friction Nw [N*m]	1031	Float	0.00	99.99	-		Yes	R	-	-
Speed P [%]	87	Float	0.00	100.00	S		Yes	R/W	-	-
Speed P Nw [%]	1032	Float	0.00	100.00	-		Yes	R	-	-
Speed I [%]	88	Float	0.00	100.00	S		Yes	R/W	-	-
Speed I Nw [%]	1033	Float	0.00	100.00	-		Yes	R	-	-
Take val	1028	U16	0	65535	-		Yes	Z/C	-	-

Fwd-Rev spd tune — Choice of direction of output rotation during the **self tuning** procedure (FWD = clockwise rotation, or REV = anti-clockwise rotation; rotation seen from the side of the drive shaft.

Test T curr lim — Uppermost torque current limit applied during self-tuning.

Start — Starts self-tuning of speed regulator.

Inertia — Inertia value in Kg*m^2 (1 Kg*m^2 = 23.76 ib*ft^2).

Inertia Nw — New inertia value in Kg*m^2 identified during the self-tuning procedure.

Friction — Friction value in N*m (1 N*m = 0.738 lb*ft).

Friction Nw — New friction value in N*m identified during the self-tuning procedure.

Speed P — Proportional gain of the speed regulator.

Speed P Nw — New value of the proportional gain of the speed regulator.

Speed I — Integral gain of the speed regulator.

Speed I Nw — New value of the integral gain of the speed regulator.

Take val — Acquisition of the new values of the parameters after self-tuning.

SPEED REGULATOR

5.7.2 Speed zero logic (spd zero logic)

Speed zero logic determines how the drive will behave when the motor is stopped.

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
SPEED REGULAT \ Spd zero logic										
Enable spd=0 I Enabled Disabled	123	U16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-
Enable spd=0 R Enabled Disabled	124	U16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-
Enable spd=0 P Enabled Disabled	125	U16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-
Spd=0 P gain [%]	126	Float	0.00	100.00	10.00		Yes	R/W	-	-
Ref 0 level	106	U16	1	32767	10		Yes	R/W	-	-

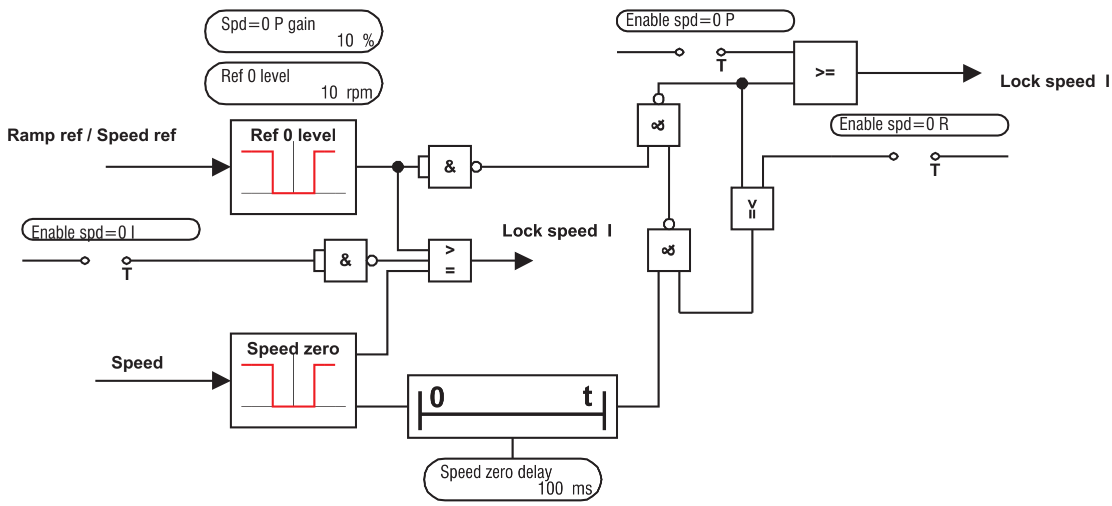


Figure 5.7.2.1: Spd zero logic.

Enable spd=0 I Enabled — Output of the integral part of the speed regulator returns to zero when the reference and feedback are equal to zero. Control, then, is solely proportional. Component I (one) is enabled when a reference value is given to re-launch acceleration.

Disabled — Function disabled

5.7 Speed regulator

SPEED REGULATOR

Enable spd=0 R	Only works if **Enable spd=0** P is enabled	
	Enabled	Proportional gain **Spd=0 P gain** is active when the motor is stopped. Is disabled when the reference speed is higher than the value defined by **Ref 0 level**.
	Disabled	Active proportional gain **Spd=0 P gain**, active when the motor is stopped. Disabled when the reference speed or the actual speed are greater than the value defined by **Ref 0 level**.
Enable spd=0 P	Enabled	When the reference value and the actual value are below **Ref 0 level** proportional gain **Spd = 0 P gain** becomes active after an interval defined by Speed zero delay. For disabling **Spd=0 P gain** the **Enable spd=0 R** parameter is used.
	Disabled	The speed regulator also retains its proportional component when the motor is stopped.

Spd=0 P gain Proportional gain is only active if the **Enable spd=0 P** function has been enabled.

Ref 0 level Threshold at which speed zero logic intervenes. Defined in the units specified by the factor function. Speeds under this threshold are defined as being equal to zero.

5.7.3 Speed-up Function

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
SPEED REGULAT \ Speed up										
Speed up gain [%]	445	Float	0.00	100.00	0.00		Yes	R/W	-	-
Speed up base [ms]	446	Float	0	16000	1000		Yes	R/W	-	-
Speed up filter [ms]	447	U16	0	1000	0		Yes	R/W	-	-

The Speed-up function is used to prevent oscillations during strong inertia changes momentum. It is made up of a part of a derivative D in the speed feedback circuit, which allows for integral gain of the speed regulator. This is also useful in the case of unstable cyclical loads on the motor (e.g. cams).

The feedback applied to the speed regulator has two parts:
- motor speed
- the output signal of the Speed up function

Please see the oscillograms in chapter 4.6.4.2.

Speed up gain Speed up function gain as a % of **Speed up base**.

Speed up base Maximum gain of the Speed up function. The value defined is 100% of the **Speed up gain** parameter.

Speed up filter Time constant of the filter D part of the Speed-up function.

SPEED REGULATOR

5.7.4 Droop function

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
SPEED REGULAT \ Droop function										
Droop gain [%]	696	Float	0.00	100.00	0.00		Yes	R/W	-	-
Droop filter [ms]	697	U16	0	1000	0		Yes	R/W	-	-
Load comp [%]	698	I16	-200	+200	0	(C)	Yes	R/W	IA	R/W
Droop limit	700	U16	0	2*P45	1500		Yes	R/W	-	-
Enable droop	699	U16	0	1	Disabled	(E)	Yes	R/W	ID	R/W
Enabled								1		1
Disabled					(0)			0		0

(C) = This parameter may be assigned to a programmable analogue input.
(E) = This parameter may be assigned to a programmable digital input.

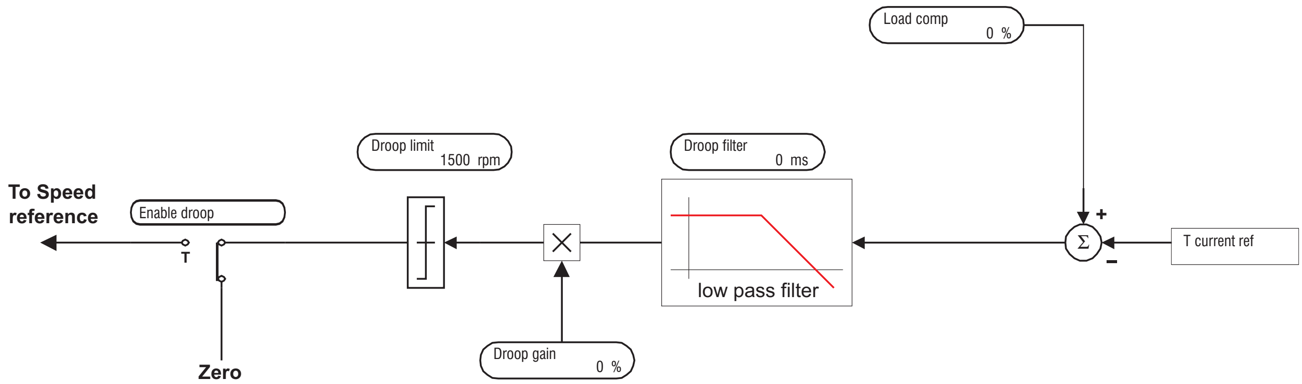


Figure 5.7.4.1: Droop compensation.

The Droop function is used to balance the current.
A typical example of when it is used is when two motors are mechanically coupled and need to turn over at the same speed. A difference in the specifications of the motors and/or in speed control adjustments on the DC drives linked to them tends to give slightly different speeds. This would lead to an overload of one of the motors, as the other would be acting as a brake.
The Droop function allows the user to eliminate the maladjustment by adding a correction term to the drive speed reference, proportional to the difference in load between the two drives. The effect is to balance the currents of the two motors (See fig. 5.7.1).

Droop gain **Droop function gain.**
This is determined as a % of the ratio between **Speed base value** and the difference between **Load comp - T current ref**. This means that when the difference between **Load comp - T current ref** is 100% and **Droop gain = 100%**, the correction signal of the reference is equal to **Speed base value**.

Droop filter Time filter constant of the function.

Load comp Load balance signal. This is typically the current of the “master” drive, but can be provided by an external control (e.g. API). The parameter may be assigned to a programmable analogue input. It is determined as a % of I_{dN}.

SPEED REGULATOR

Enable droop	Enabled	Droop function enabled
	Disabled	Droop function disabled

Droop limit Determines the range of correction of the speed reference within which the Droop function is active. The value is based on the factor function.

(For more information, please see fig. 5.7.1 “diagram of how the speed regulator works”).

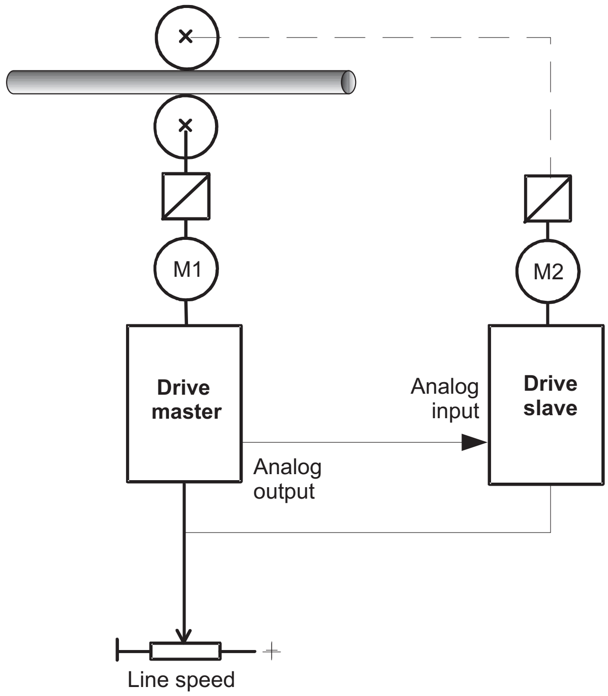


Figure 5.7.4.2: example of the Droop function on a steel-pipe manufacturing machine.

Example of tuning: —> Aim: Motor 1 torque should be equal to motor 2 torque

Master DC drive	**Slave DC drive**
Analogue input 1 = Speed ref 1	Analogue input 1 = Speed ref 1
Analogue output 1 = Speed ref 1	Analogue output 2 = Load comp
	Enable droop = Enable
	Droop gain = 5%
	Droop filter = 100 ms
	Droop limit = 1000

SPEED REGULATOR

5.7.5 Compensation of inertia and friction (Inertia/loss cp)

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
SPEED REGULAT \ Inertia/loss cp										
Inertia [kg*m*m]	1014	Float	0.001	999.999	S		Yes	R/W	-	-
Friction [N*m]	1015	Float	0.000	99.999	S		Yes	R/W	-	-
Torque const [N*m/A]	1013	Float	0.01	99.99	S		Yes	R	-	-
Inertia c filter [ms]	1012	U16	0	1000	0		Yes	R/W	-	-

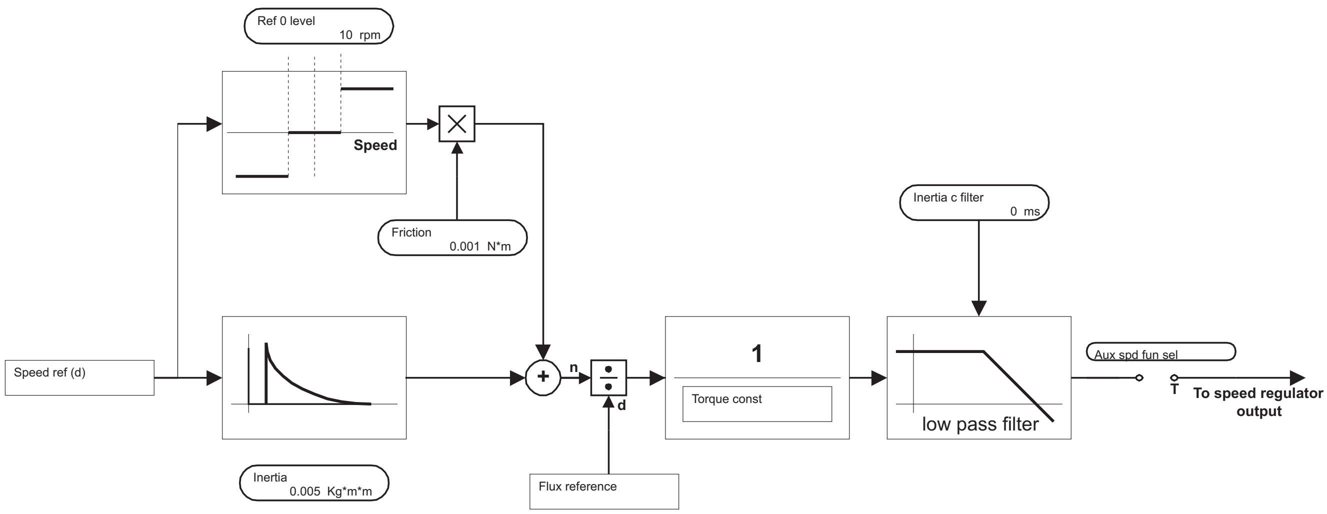


Figure 5.7.5.1: Compensation of inertia and friction.

An increase in the response speed of the speed regulator to a variation in the reference can be obtained by modifying the value of the current during acceleration or deceleration to counterbalance the inertia of the drive motor.

These parameters are identified in the speed loop self-tuning procedure ***Speed self tune*** (START UP\Speed self tune and SPEED REGULAT\Self tuning), but they can also be manually adjusted by the operator.
Enabling this function makes it impossible to use the **Speed up** function. It must be selected using the **Aux spd fun sel** parameter (on the SPEED REGULAT menu).

Inertia Total inertia of the drive shaft in kg*m^2 identified during the self-tuning procedure (1 kg*m^2 = 23.76 lb*ft^2).

Friction Friction value in N*m identified during the self-tuning procedure (1 N*m = 0.738 lb*ft).

Torque const Motor torque constant in N*m/A. Used to calculate compensation of inertia and friction. It is automatically adapted during field weakening.

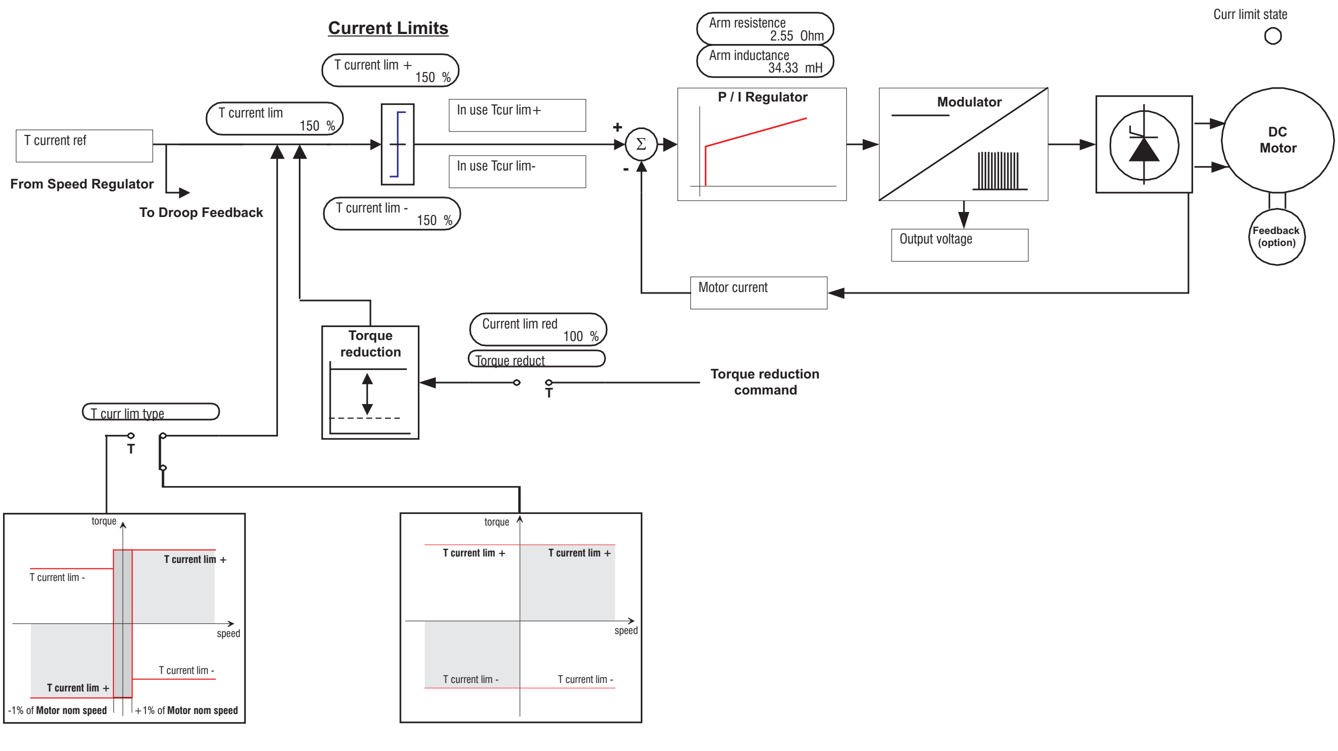
Inertia c filter Top-ranking low-step filter. This filter reduces the oscillation in the Inertia/Loss comp. block.

5.8 Current regulator

CURRENT REGULATOR Armature current regulator function

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
CURRENT REGULAT										
T current ref [%]	41	I16	-200	+200	-	(A)	Yes	R	QA	R
Motor current [%]	199	I16	-250	250	-		Yes	R	QA	R
Arm resistance [ ]	453	Float	S	S	0.500		Yes	R/W	-	-
Arm inductance [mH]	454	Float	S	S	4.00		Yes	R/W	-	-
Current scale	1365	Float	0.3	2.0	1		Yes	R/W	-	-
E int [V]	587	I16	-80	+80	-	(A)	Yes	R	QA	-
R&L search ON OFF	452	U16	0	1	OFF (0)		Yes	R/Z 1 0	-	-
Zero torque Not active Active	353	U16	0	1	Not active (1)	(E)	Yes	R/W 1 0	ID H L	R/W

(A) = This parameter may be assigned to a programmable analogue output.
(E) = This parameter may be assigned to a programmable digital input.



Motoring & Generating Torque Limit **Torque Limit +/-**

Figure 5.8.1: Torque regulation through the current.

The **Full load curr** parameter on the CONFIGURATION menu defines the rated current of the motor. It also corresponds to the output current of the converter with **T current ref** = 100%.

T current ref Total reference value of the current as a % of **Full load curr**. For this parameter, DCVN94 DC drives require a positive value. In this case, negative references are processed and correspond to a reference value of zero.

5.8 Current regulator

CURRENT REGULATOR

Motor current	Armature current in % of **Full load curr**.
Arm resistance	Motor armature resistance in Ω. When the self-calibration cycle is performed using **R&L search**, this parameter is automatically updated. That is why, if necessary, it can be changed manually.
Arm inductance	Motor armature inductance in mH. When the self-calibration cycle is performed using **R&L search**, this parameter is automatically updated. That is why, if necessary, it can be changed manually.
Current scale	This parameter allows to change **Full load curr** parameter from 30% to 200% of its value.
E int	Auxiliary signals used to determine whether the current regulator is well-adjusted. The value should be as low as possible. Values between -40V and + 40V are acceptable (max ± 80V).
R&L search	Self-calibration cycle of the current regulator. The armature resistance and inductance values are calculated and set in the parameters **Arm resistance** and **Arm inductance**.
Zero torque	The parameter may be used to set the reference value **T current ref** for the armature current to zero, so that the drive has no more torque. Not active — **T current ref** not set to zero Active — **T current ref** set to zero. The drive has no torque.

5.9 Flux regulation

FLUX REGULATION field regulator function, flow/if curve

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
FLUX REGULATION										
Enable flux reg	497	U16	0	1	ON	(E)	Yes	R/W	ID	-
ON					(1)			1	H	
OFF								0	L	
Flux reg mode	469	U16	0	2	Const. current		Yes	R/Z	-	-
Constant current					(0)			0		
Voltage control								1		
External control								2		
Enable flux weak	498	U16	0	1	OFF	(E)	Yes	R/W	ID	-
ON								1	H	
OFF					(0)			0	L	
Speed-0 f weak	499	U16	0	1	OFF		Yes	R/W	-	-
ON								1		
OFF					(0)			0		
Flux reference [%]	500	Float*	0.0	100.0	0.0	(A)	Yes	R	QA	-
Flux current [%]	234	Float*	0.0	100.0	-	(A)	Yes	R	QA	R
Out vlt level	921	Float*	0	100.0	100.0	(A), (C)	Yes	R/W	IA, QA	R/W
FLUX REGULATION \ Flux \ if curve										
I field cnst 40	916	Float	0	100.0	40.0		Yes	R/Z		-
I field cnst 70	917	Float	0	100.0	70.0		Yes	R/Z		-
I field cnst 90	918	Float	0	100.0	90.0		Yes	R/Z		-
Set flux / if	919	U16					Yes	Z/C		-
Reset flux / if	920	U16					Yes	Z/C		-
Nom flux curr [A]	374	Float	0.5	80.0	S		Yes	R/Z	-	-
Motor nom flux [A]	280	Float	0.0	P374	P374x0.3		Yes	R/Z	-	-

(A) = This parameter may be assigned to a programmable analogue output.
(C) = This parameter may be assigned to a programmable analogue input.
(E) = This parameter may be assigned to a programmable digital input.

5.9 Flux regulation

FLUX REGULATION

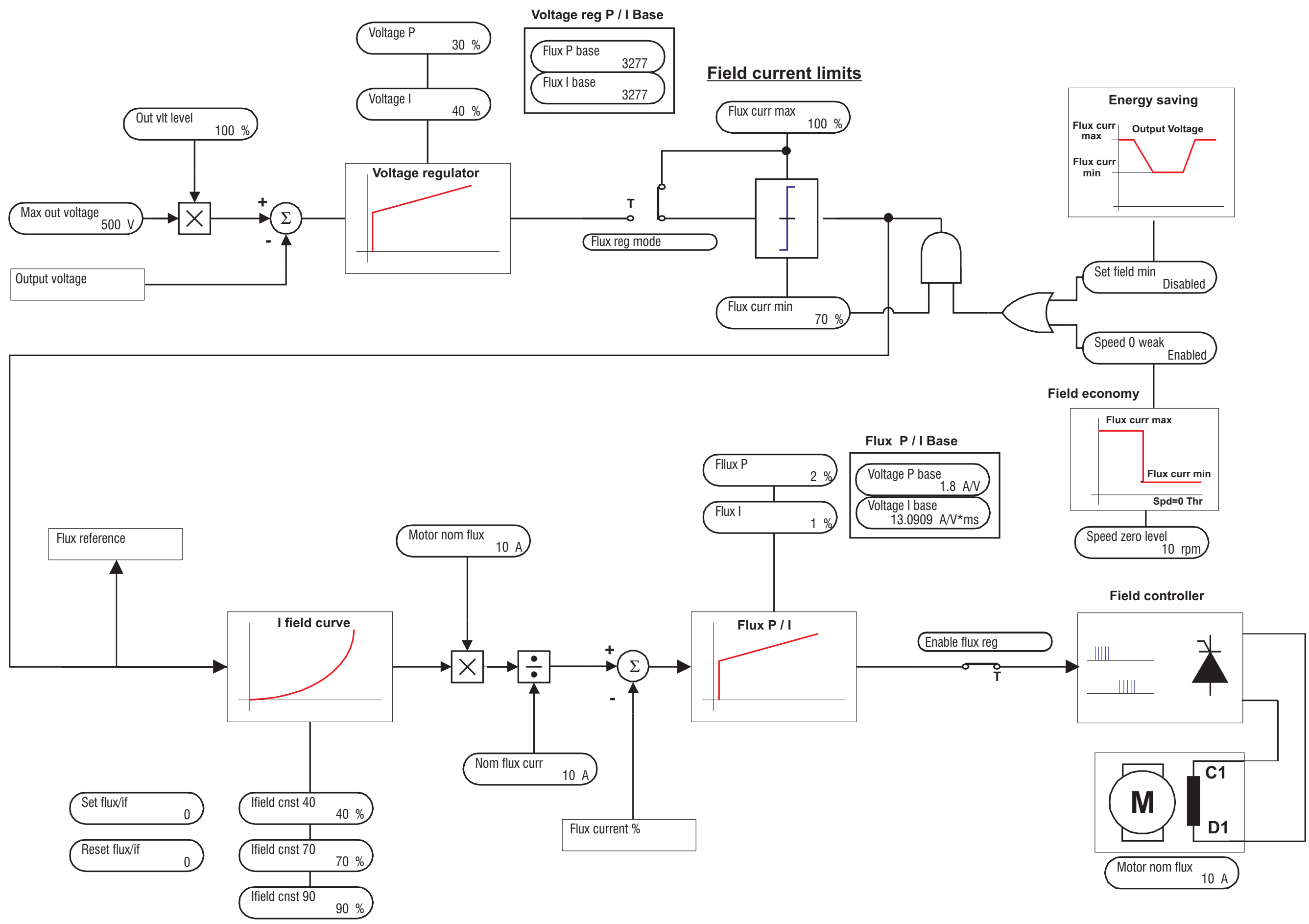


Figure 5.9.1: controls motor excitation.

Enable flux reg	Starts the field excitation regulator	
	ON	Field excitation regulator on.
	OFF	Field excitation regulator off. There is no field current.
Flux reg mode	Mode of operation of the field excitation regulator.	
	Constant current	The motor is working with a constant DC field current. The value of the current is the same as the one programmed using the **Motor nom flux** parameter. If no curve is defined by the **I field cnst** parameters, this value may be adjusted in a linear fashion using **Flux current max** (% of excitation current as a function of **Motor nominal flux**) (see Flux /if curve paragraph 4.6.4.1)

FLUX REGULATION

	Voltage control	The motor is working in field weakening (torque control) mode with variable voltage being applied to the motor field winding. Maximum armature voltage is adjusted using the **Max out voltage** parameter on the CONFIGURATION menu.
	External control	The motor field circuit is powered by a source other than the DC drive (field rectifier/converter).

Enable flux weak — Validation of the energy-saving function

ON	The field excitation current is the same as the value set using the **Flux current min** parameter.
OFF	The field excitation current is set based on the mode of operations and the conditions under which the motor is working when in field weakening mode.

Speed-0 f weak — Minimum field excitation current, as per the Flux current min parameter, that is applied when the **Start** and **Fast stop** commands = 0.

Can be used to reheat the motor if safety conditions do not require the motor to be unplugged when stopped.

ON	Function operational
OFF	Function not operational

Flux reference — 100% as per the **Motor nom flux** parameter.

With the Flux/if curve function enabled, this reference corresponds to the flux reference as per the curve determined.

With the Flux/if curve function non-enabled (default value), this reference corresponds to the excitation current reference.

Flux current — Excitation current feedback, expressed as a % of the **Motor nom flux** parameter.

Out vlt level — % of maximum armature voltage, as per the **Max out voltage** parameter.

This parameter allows motor armature voltage to be changed in «Voltage control» mode (FLUX REGULATION\Flux reg mode).

I field cnst 40 — Current value at 40% flux.

I field cnst 70 — Current value at 70% flux.

I field cnst 90 — Current value at 90% flux.

Set flux / **if** — Command to adjust the flux curve in relation to the one programmed on **I field cnst 40-70-90.**

With the curve defined, the indication **Flux current max**/**Flux reference** only shows the % of flux according to the features of this curve.

Thus the value of the field current will also be determined by this feature (see Flux /if curve paragraph 4.6.4.1).

Reset flux / **if** — Command to use the flux curve adjusted using the **Set flux** / **if** command.

With this command, the **Motor nominal flux** parameter is once again changed in a linear fashion by **Flux current max**/**Flux reference**.

5.9 Flux regulation

FLUX REGULATION

Nom flux curr

Calibration of the field reguator; IdFN. To improve the behaviour during adjustment, the maximum field current can be reduced using the S14 switch on the control board (see the table in the chapter 2.3.3).

E.g.:

Armature :	500 V	Excitation voltage: 230 V
	102 A	0.8 A
Drive type:	DCVN104C18S	(Excitation current 14 A max)

Adjust S14 so as to adapt the product of the excitation regulator as closely as possible to the motor specifications:

Switch ohms	148 ohm	330 ohm	182 ohm	36.4 ohm	845 ohm	1650 ohm	**Equivalent**
Field curr scale	**S14-1**	**S14-2**	**S14-3**	**S14-4**	**S14-5**	**S14-6**	**resistance**
1.0 A	OFF	OFF	OFF	OFF	OFF	ON	1650 ohm

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Set the parameter **Nom flux curr** to 1A.

Motor nom flux

Rated field current I_{dFN} of the motor connected.
In the above example: **Motor nom flux** = 0.8A.

5.10 Reg.parameters

REG PARAMETERS Adjustment of speed, excitation current, armature voltage regulators

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
REG PARAMETERS \ Percent values \ Speed regulator										
Speed P [%]	87	Float	0.00	100.0	10.00		Yes	R/W	-	-
Speed I [%]	88	Float	0.00	100.0	1.00		Yes	R/W	-	-
Speed P bypass [%]	459	Float	0.00	100.0	10.00		Yes	R/W	-	-
Speed I bypass [%]	460	Float	0.00	100.0	1.00		Yes	R/W	-	-
REG PARAMETERS \ Percent values \ Flux regulator										
Flux P [%]	91	Float	0.00	100.0	2.00		Yes	R/W	-	-
Flux I [%]	92	Float	0.00	100.0	1.00		Yes	R/W	-	-
REG PARAMETERS \ Percent values \ Voltage reg										
Voltage P [%]	493	Float	0.00	100.0	30.00		Yes	R/W	-	-
Voltage I [%]	494	Float	0.00	100.0	40.00		Yes	R/W	-	-
REG PARAMETERS \ Base values \ Speed regulator										
Speed P base	93	Float	0.001	S	0,300 P93max		Yes	R/Z	-	-
Speed I base	94	Float	0.001	S	0,3 P94max		Yes	R/Z	-	-
REG PARAMETERS \ Base values \ Flux regulator										
Flux P base	97	Float	1	32767	3277		Yes	R/Z	-	-
Flux I Base	98	Float	1	32767	3277		Yes	R/Z	-	-
REG PARAMETERS \ Base values \ Voltage reg										
Voltage P base	495	Float	0.0100	S	S		Yes	R/Z	-	-
Voltage I base	496	Float	0.01	S	S		Yes	R/Z	-	-
REG PARAMETERS \ In use values										
Speed P in use [%]	99	Float	0.00	100.00	S		Yes	R	-	-
Speed I in use [%]	100	Float	0.00	100.00	S		Yes	R	-	-

Speed P Proportional gain K_P* of the speed regulator expressed as a % of **Speed P base**.

Speed I Integral gain K_I* of the speed regulator expressed as a % of **Speed I base**.

Speed P bypass Proportional gain K_P* of the speed regulator expressed as a % of **Speed P base** when feedback from the tachogenerator or the encoder is changed in speed feedback (**Enable fbk bypas** = Enabled).

Speed I bypass Proportional gain K_I* of the speed regulator expressed as a % of **Speed I base** when feedback from the tachogenerator or the encoder is changed in speed feedback (**Enable fbk bypas** = Enabled).

Flux P Proportional gain K_P* of the flux regulator expressed as a % of **FluxP base**.

Flux I Integral gain K_I* of the flux regulator expressed as a % of **Flux I base**.

Voltage P Proportional gain K_P* of the excitation voltage regulator expressed as a % of **Voltage P base**.

Voltage I Integral gain K_I* of the excitation voltage regulator expressed as a % of **Voltage I base**.

Speed P base Proportional gain K_{P0} of the speed regulator in A/rpm (base value).

5.10 Reg parameters

REG PARAMETERS

Speed I base Integral gain K_{I0} of the speed regulator in A/rpmxms (base value).

Flux P base Proportional gain K_{P0} of the field excitation current regulator in A/Vs (base value).

Flux I base Integral gain K_{I0} of the field excitation current regulator in A/Vs (base value).

Voltage P base Proportional gain K_{P0} of the field excitation voltage regulator in A/Vs (base value).

Voltage I base Integral gain K_{I0} of the field excitation voltage regulator in A/V x ms (base value).

Speed P in use Displays the active proportional gain of the speed regulator as a % of **Speed P base**.

Speed I in use Displays the active integral gain of the speed regulator as a % of **Speed I base**.

The maximum value of the regulator parameters is defined by the base values. Possible adjustments depend on the size of the DC drive.
It is possible to optimise regulator function by changing the % (values marked with a *).
The resulting gains for the regulator are calculated as follows:

$K_P = K_{P0} \cdot K_P^* / 100\ \%$ $K_I = K_{I0} \cdot K_I^* / 100\ \%$

Example of speed regulator:

Speed P base = 12 (= K_{P0}) **Speed P** = 70 % (= K_P^*)
Proportional gain K_P = 12 · 70 % / 100 % = 8.4

The base values **... base** are also the absolute reference point for using variable gains.

When the variable gains function is enabled, (**Enable spd adap** = Enabled), the parameters **Speed P** and **Speed I** have no effect. However, they keep their value and work again once the function is disabled.
The **Speed P in use** and **Speed I in use** parameters indicate gains during use of the speed regulator. This is the case when the variable gains function is enabled.

5.11 Configuration

CONFIGURATION	Mode of operation, feedback type, scaling, default allocation, communication, password

5.11.1 Choice of mode of operation

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
CONFIGURATION										
Main commands	252	U16	0	1	Term.		Yes	R/Z	-	-
Digital								1		
Terminals					(0)			0		
Control mode	253	U16	0	1	Local		Yes	R/Z	-	-
Bus								1		
Local					(0)			0		

Main commands

This parameter defines where the E**nable drive, Start** and **Fast stop** should be issued.

Terminals: The above commands are only taken into account on the terminal block.

Digital: The commands must be selected simultaneously by the terminal block and the digital channel (keyboard or RS485 or bus, depending on **Control mode**). If, for example, a DC drive stop has been caused by de-activating the **Start** command on terminal 13, the voltage on terminal 13 and the command via digital channel are required to be able to restart it. This also applies to an interruption of the **Fast stop** command. If, however, the **Stop** command is requested via the digital channel, the digital **Start** command will suffice to restart the DC drive.

Changing the control mode of the drive from digital commands to the terminal block (Terminals) can only be done when terminals 12 (Enable) and 13 (Start) are disconnected. By passing the commands from Digital to Terminals with the terminals enabled, the message “**Change input**” will appear, indicating that this is impossible.

Control mode

This parameter defines whether the digital channel is the keyboard/ RS485 or a bus system (CANopen option).

Local: The digital channel is the keyboard or the RS485 serial interface

Bus: The digital channel is a bus system (Optional)

5.11 Configuration

CONFIGURATION

The following tables show the different modes of operation possible.

Parameters: Main commands	Parameters: Control mode	Assignment of: Enable drive Start Fast stop	Assignment of: Change Control mode	Acknowledgement failures (Failure reset)	Save parameters (Save parameters)
Terminals	Local	terminals	keyboard/ RS485	terminals or keyboard	keyboard/ RS485
Digital	Local	terminals or keyboard RS485	keyboard/ RS485	terminals or keyboard	keyboard/ RS485
Terminals	Bus	terminals	keyboard* RS485* or Bus	terminals or keyboard* or Bus	keyboard/ RS485 or Bus
Digital	Bus	terminals and Field Bus	keyboard* RS485* or Bus	terminals or keyboard* RS485* or Bus	keyboard/ RS485 or Bus

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Parameters: Command mode	Parameters: Control mode	Options to access via: Terminals	Options to access via: Keyboard/RS485	Options to access via: Bus
Terminal	Local	Access to everything assigned to the programmable I/Os	Access to all parameters not assigned to the programmable I/Os	none
Keyboard	Local	Access to everything assigned to the programmable I/Os	Access to all parameters not assigned to the programmable I/Os	none
Terminal	Bus	Access to everything assigned to the programmable I/Os	- read all - save parameters - fault acknowledgments* - control mode selection*	Access to all parameters not assigned to the programmable I/Os
Keyboard	Bus	Access to everything assigned to the programmable I/Os	- read all - save parameters - fault acknowledgments* - control mode selection*	Access to all parameters not assigned to the programmable I/Os

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* Access via keyboard or RS485 serial interface protected in this configuration by **Password level 1**

Note! Write access to the Bus by Process Data Channel is not affected by the Control Mode.

CONFIGURATION

5.11.2 Base values and maximum armature voltage

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
CONFIGURATION										
Speed base value	45	U32***	1	16383	1500		Yes	R/Z	-	R
Full load curr [A]	179	Float	0.1	I_{dN}	IdN		Yes	R/Z	-	-
Max out voltage [V]	175	Float	20	999	400		Yes	R/Z	-	-
Ok relay funct	412	I16	0	1	0		Yes	R/Z	-	-
Ready to Start								1		
Drive healthy								0		

Speed base value

Speed base value is defined in the units specified by the factor function. It is the benchmark value for all speed values (reference values, adaptive speed regulator...), given as a %. It corresponds to 100% of the total speed range. This parameter can only be changed if the DC drive is locked (Enable drive = Disabled). **Speed base value** does not define the maximum speed possible, which can be obtained by adding certain base values. It is defined by **Speed max amount**

Full load curr

The **Full load curr** parameter is defined in A. It is the rated motor current and 100% of **T current lim**. The current limits and the overload function are based on this value.

Max out voltage

Maximum armature voltage. When defined in the **Flux reg mode** “Voltage control”, **Max out voltage** function, it corresponds to the voltage at which the field weakening stage starts. This parameter affects the armature overload detection threshold “Overvoltage”.

5.11.3 Configuration of the OK relay (terminals 35, 36)

Ok relay func

This parameter defines the conditions under which the relay output closes.

Drive healthy — The relay closes when the drive is supplied with control voltage and when there are no error messages.

Ready to start — The relay closes when the following conditions are met:

- The DC drive is supplied with control voltage
- No error message
- The DC drive is enabled with the **Enable drive** signal.

CONFIGURATION

5.11.4 Configuration of speed feedback circuit

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
CONFIGURATION \ Speed fbk										
Motor max speed [rpm]	162	Float *	0	6553	1500		Yes	R/Z	-	R
Speed fbk sel	414	U16	0	3	1		Yes	R/Z	-	R
Encoder 1								0		
Encoder 2								1		
Tacho								2		
Armature								3		
Encoder 1 state	648	U16	0	1			-	R	QD	R
Encoder ok								1		1
Encoder Fault								0		0
Enable fbk contr	457	U16	0	1	Enabled		Yes	R/Z	-	-
Enabled					(1)			1		
Disabled								0		
Enable fbk bypas	458	U16	0	1	Disabled		Yes	R/Z	-	-
Enabled								1		
Disabled					(0)			0		
Flux weak speed [%]	456	U16	0	100	100		Yes	R/Z	-	R
Speed fbk error [%]	455	U16	0	100	22		Yes	R/Z	-	-
Tacho scale	562	Float	0.90	3.00	1.00		Yes	R/W	-	-
Speed offset	563	Float	-20.00	+20.00	0		Yes	R/W	-	-
Encoder 1 pulses	416	Float *	600	9999	1024		Yes	R/Z	-	R
Encoder 2 pulses	169	Float *	150	9999	1000		Yes	R/Z	-	R
Refresh enc 1	649	U16	0	1	Disabled		Yes	R/W	-	-
Enabled								1		
Disabled					(0)			0		
Encoder 2 state	651	U16	0	1			-	R	QD	R
Encoder ok								1		1
Encoder Fault								0		0
Refresh enc 2	652	U16	0	1	Disabled		Yes	R/W	-	-
Enabled								1		
Disabled					(0)			0		
Enable ind store	911	U16	0	1	Disabled		Yes	R/W	-	R/W
Enabled								1		
Disabled					(0)			0		
Ind store ctrl	912	U16	0	65535	0		-	R/W	-	R/W
Index storing	913	U32	0	$+2^{32}-1$	0		-	R	-	R

Note! The encoder or the tachogenerator must be in regulation mode **Flux reg mode** «Voltage control» and «External control».

CONFIGURATION

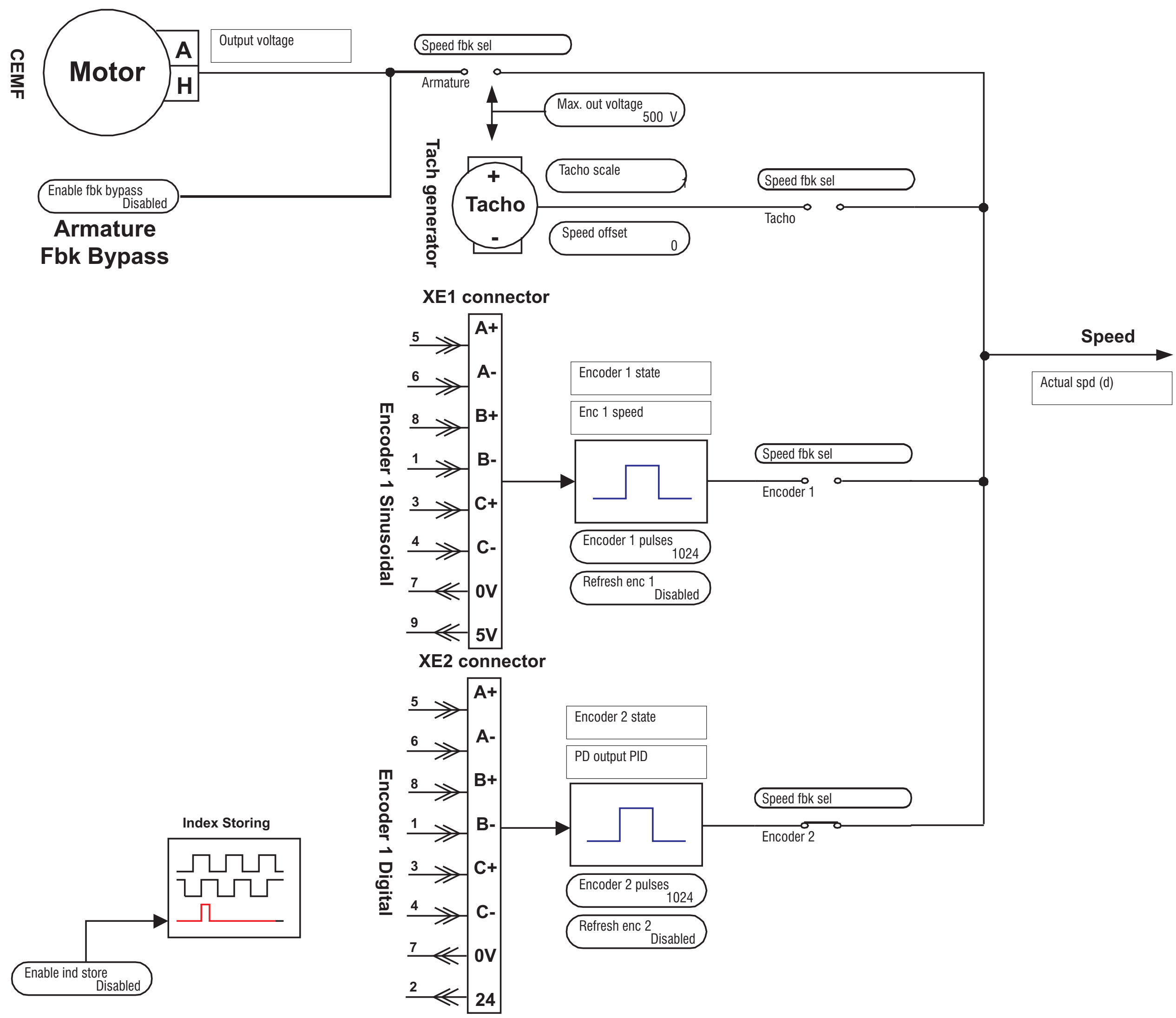

Figure 5.11.4.1: speed feedback circuits.

Motor max speed Maximum motor speed. Used to convert the values issued by Encoder 2 from the tachogenerator and armature voltage in tr/mn. In the case of armature voltage feedback, the **Max out voltage** parameter is considered equivalent to **Motor max speed**. This parameter must be programmed.

Speed fbk sel Selection of type of feedback to be used.

Encoder 1	Use of a sinusoidal encoder connected to XE1 connector.
Encoder 2	Use of an incremental encoder connected to XE2 (standard) connector.
Tacho	Use of a tachogenerator connected to + and - terminals.
Armature	The internal value of the armature voltage is used. No external connections are required.

CONFIGURATION

Enable fbk contr

Validation of speed feedback control.

Enabled	Control enabled
Disabled	Control disabled

This function controls speed feedback coherence, comparing armature voltage and the speed value read by the encoder or the tachogenerator. When a deviation higher than the value fixed using the **Speed fbk error** parameter is detected, the message «Speed fbk loss» displays. This function is automatically disabled when speed feedback is performed using armature voltage. (**Speed fbk sel** = Casing).

Enable fbk bypas

Validation of automatic change-over to armature feedback when the error message “Speed fbk loss” begins.

Enabled	automatic change-over enabled
Disabled	automatic change-over disabled

After automatic change-over to armature feedback, the speed regulator works using the **Speed P bypass** and **Speed I bypass** parameters from the REG PARAMETERS/Percent values/Speed regulator menu, and the part diverted from the speed regulator is automatically disabled.

Please remember that speed regulator gains are considerably reduced in armature feedback mode. The error message «Speed fbk loss» should be configured to correspond to «Activity=Warning». Change-over is only possible with a fixed DC field excitation current.

Flux weak speed

Speed value as a % of **Motor max speed** at which the field weakening stage begins. The **Flux weak speed** parameter, when speed feedback control is enabled (**Enable fbk contr** = Enabled), is used to take into account the fact that, during field weakening, armature voltage and speed feedback signal are not proportional. If the motor is working with a constant torque over the entire range of regulation (**Flux reg mode** = Direct Current), the factory setting of 100% must be entered.

For example, if field weakening is 2 a value of 50% should be entered in this parameter.

Speed fbk error

Maximum error allowed, as a % of maximum output voltage (**Max out voltage**).

By using **E max Voltage**, **Flux weak speed** and **Motor max speed**, a ratio between motor speed and armature voltage can be obtained.

If there is a difference above Speed fbk error, a **Speed fbk loss** failure is detected and indicated.

Tacho scale

Fine calibration of the tachogenerator (**Speed fbk sel** = Tacho): return from the feedback product TD calculated as S4 switch divided by the actual TD feedback value at maximum speed.

Speed offset

Offset calibration of the speed feedback circuit.

Encoder 1 pulses

Number of pulses per revolution of the sinusoidal encoder connected to XE1 connector.

Encoder 2 pulses

Number of pulses per revolution of the incremental encoder connected to XE2 connector. **Encoder 2 pulses** and **Motor max speed** torque should be within the zone authorised as per fig. 5.11.4.2.

CONFIGURATION

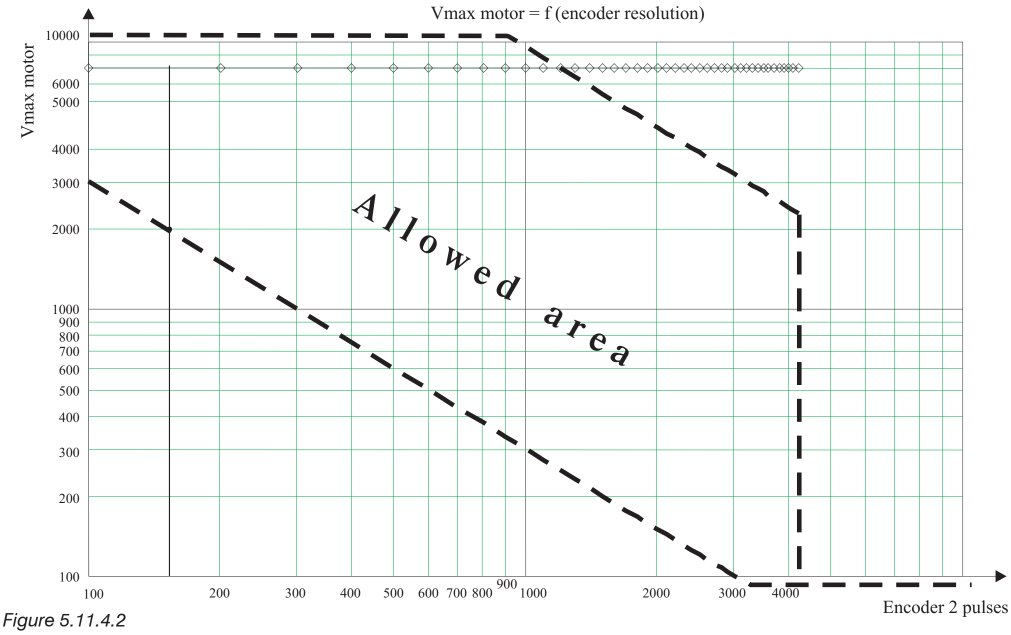

Figure 5.11.4.2

Refresh enc 1 Enables encoder 1 surveillance (XE1 connector).

Enabled	The sinusoidal encoder is controlled
Disabled	The sinusoidal encoder is not controlled

In case of anomaly, the message «Speed fbk loss» will display. Status can be read by the Bus and the serial link via **Encoder 1 state**. The control is enabled by selecting the parameter **Enable fbk contr**=Enabled.

Refresh enc 2 Enables encoder 2 surveillance (XE2 connector).

Enabled	The incremental encoder is controlled
Disabled	The incremental encoder is not controlled

In case of anomaly, the message «Speed fbk loss» will display. Status can be read by the Bus and the serial link via **Encoder 2 state**. The control is enabled by selecting the parameter **Enable fbk contr**=Enabled.

Encoder 1 state Indicates the status of the connection between encoder 1 and XE1. The indication is enabled using **Refresh enc 1**.

Encoder 2 state Indicates the status of the connection between encoder 2 and XE2. The indication is enabled using **Refresh enc 2**.

Note! The parameters **Tacho scale** and **Speed offset** are used for the tachogenerator to perform accurate calibration of the speed feedback circuit. When the parameters set at the factory are loaded (**Load default**), these two parameters are not changed, so new calibration is not required.

The following parameters allow the user to determine absolute zero on the machine and to perform a position control using the optional DCVS5W04 application development and programming board.

Enable ind store This parameter allows the user to read absolute zero pulse on the encoder (“Top zero” or “zero cam” signal) used in systems when performing position control.

Enabled	This adjustment enables Top Zero read-out.
Disabled	This adjustment disables Top Zero read-out.

Ind store ctrl Encoder zero pulse control log.

Index storing Data and function status log.

CONFIGURATION

Parameter Ind store ctrl [912]

Bit. No.	Name	Description	Access (Read/Write)	Failure
0-1	-	Not used	-	-
2	POLNLT	Indicates the polarity of the zero cam of the digital encoder (can): 0 = Positive-going transition 1 = Negative-going transition	R/W	0
3	-	Not used	-	-
4-5	ENNQUAL	Indicates the level of the qualification signal which activates the read of the zero cam: 0 = OFF 1 = OFF 2 = Passing signal = 0 3 = Passing signal = 1	W	0
6	Enc target Num	Indicates the encoder to which the values of this parameter belong (from board DCVS5W04): 0 = the operations requested must be carried out on Encoder 1 1 = the operations requested must be carried out on Encoder 2		0
7	-	Not used	-	-
8-9	ENNLT	Controls the read function of the zero cam: 0 = OFF, function completely disabled 1 = Once, activates only the first transition of the zero-cam 2 = Continuous, activates continuous read of the zero cam:	R/W	0

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Parameter Index storing [913]

Bit. No.	Name	Description	Access (Read/Write)	Failure
0	Enc source Num	Indicates the encoder to which the values of this parameter belong (of the drive): 0 = the data contained in the parameter relating to encoder 1 1 = the data contained in the parameter relating to encoder 2	R	0
1	MP_IN	Indicates the actual value of the qualifier signal in the Vecon input: 0 = qualifier signal for low voltage rating 1 = qualifier signal for high voltage rating	R	0
2 3	STATNLT	Status of acquisition function: 0 = OFF 1 = Once, the acquisition has not yet been executed 2 = Once, the acquisition has already been executed 3 = Continuous	R	0
16-31	CNTNLT	Value of position counter corresponding to the zero cam. This value has a direction only when STANLT equals 2 or 3	R	0

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CONFIGURATION

5.11.5 Selection of "Standard/American", Version "SOFTWARE"

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
CONFIGURATION \ Drive type										
Drive size [A]	465	U16	0	S	S		Yes	R	-	R
2B + E ON OFF	201	U16	0	1	OFF (0)		Yes	R/Z 1 0		-
Size selection American Standard	464	U16	0	1	S		Yes	R/Z 1 0	-	-
Software version	331	Text					Yes	R	-	-
Drive type DCVN94… DCVN104…	300	U16	10	11	S		-	R 10 11	-	R 10 11

Drive size Displays DC drive armature current in amperes (encoded by switch S15 on the control board). The value given will depend on the **Size selection** parameter.

2B + E Selection of DCVN94 configuration +external field excitation. Only applies to DCVN94-type DC drives. The function allows the DC drive to work with an external field excitation regulator. When the parameter is set to On the Ramp/Speed/T current references and speed measurements behave in exactly the same fashion as those of the DCVN104 DC drive.

Size selection By selecting "Standard" the DC drive can provide continuous rated current under normal environmental conditions with no overload. In America rated current is defined by taking into account a 1.5-times overload for a duration of 60 seconds. This implies a rated current reduction of the DC drive for the same type of device.

Standard The DC drive can provide continuous rated current I_{dN}. It is indicated as **Drive size**. No overload function is programmed.

American Rated current is reduced and indicated in Full load current and in Drive size.

The overload function is automatically enabled (FUNCTION\Overload control). It is programmed as follows:

Enable overload = ON **Overload mode** = Limited
Overload time = 60s **Full load current**=American
Pause time = 540s **T current lim** = 150%
Overload current=150% **T current lim+** = 150%
Base current = 100% **T current lim -** = 150%

If «American» is selected, the **Overcurrent thr** [584] parameter is set to 160%.

CONFIGURATION

Note! If the DC drive is reconfigured to «Standard», these parameters and the rated current limit will automatically take up the values corresponding to this configuration (overload not in use) and the Overcurrent thr [584] parameter value will be 110%.

Software version Displays DC drive software version information.

Drive type Displays the type of drive: **2B** (2 quadrants) or **4B** (4 quadrants).

5.11.6 Factor function (Dimension factor, Face value factor)

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
CONFIGURATION \ Dimension fact										
Dim factor num	50	I32***	1	65535	1		Yes	R/Z	-	R
Dim factor den	51	I32***	1	$+2^{31}$ -1	1		Yes	R/Z	-	R
Dim factor text	52	Text			rpm		Yes	R/Z	-	-
CONFIGURATION \ Face value fact										
Face value num	54	I16	1	+32767	1		Yes	R/Z	-	R
Face value den	53	I16	1	+32767	1		Yes	R/Z	-	R

The factor function refers to two factors, the dimension factor and the face value factor. The two factors are defined as fractions.
The dimension factor is used to specify DC drive speed in a measurement which is in relation to the associated machine, e.g. kg/h or m/min.
The face value factor is used to increase resolution.
Please see below some examples of calculations.

Dim factor num Dimension factor numerator

Dim factor den Dimension factor denominator

Dim factor text Unit of the dimension factor (5 characters). This text appears on the display to specify the reference value.
Characters allowed: / % & + , - . 0...9 : < = > ? A...Z [ ] a...z

Face value num Face value factor numerator

Face value den Face value factor denominator

The reference value given, multiplied by the dimension factor and the face value factor defines motor speed in tr/mn

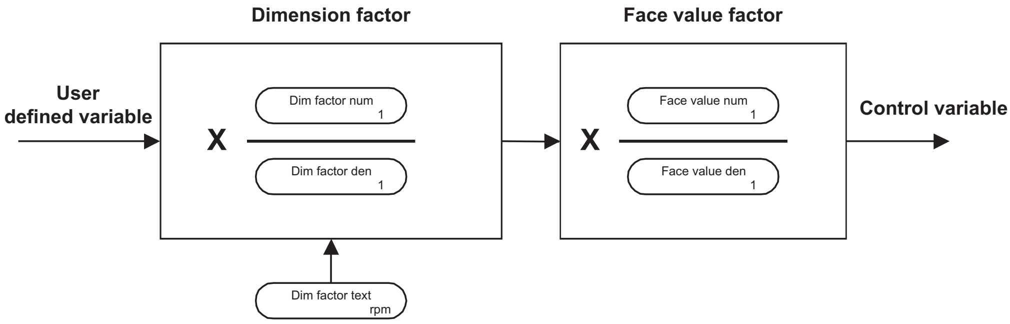

Figure 5.11.6.1: Calculation using the Dimension and Face Value factors.

CONFIGURATION

Example 2 of dimension factor calculation

DC drive speed is given in m/s. The conversion rate is 0.01 m per revolution of the motor (Note: Face value factor = 1). The dimension factor is calculated on the basis of

$$\text{Dimension factor} = \frac{\text{output (tr/mn)}}{\text{Input (here: m/s)}}$$

0.01 m refers to 1 revolution of the drive shaft
0.01 m/min (i.e. 0.01m / 60s) refers to 1 revolution motor/min

$$\text{Dimension factor} = \frac{1}{\text{min}} \bullet \frac{60\text{s}}{0.01\text{ m}} \bullet \frac{6000}{1} \bullet \frac{1}{\text{min}} \bullet \frac{\text{s}}{\text{m}}$$

When calculating the dimension factor, the units should not be reduced (1 min is not reduced to 60s)

Dim factor num 6000 **Dim factor den** 1 **Dim factor text** m/s

Example 2 of dimension factor calculation

The reference value for a bottling unit is given in bottles per minute. One revolution of the motor refers to the filling of 0.75 bottles. This corresponds to a dimension factor of 4/3 (1 / [3/4]) . The speed limitation and the ramp function are also given in bottles per minute.

$$\text{Dimension factor} = \frac{\text{output (tr/mn)}}{\text{Input (here: bottles/s)}}$$

3/4 of a bottle corresponds to 1 revolution of the drive shaft

$$\text{Dimension factor} = \frac{1}{\text{min}} \bullet \frac{4\text{ min}}{3\text{ bottles}} \bullet \frac{4}{3} \bullet \frac{1}{\text{min}} \bullet \frac{\text{min}}{\text{bottles}}$$

Units should not be shortened to calculate the dimension factor.

Dim factor dum 4 **Dim factor den** 3 **Dim factor text** bt/mn (bottles per minute)

Example of face value factor

In principle, the reference value is a resolution of1 tr/mn. To increase resolution, the face value factor is used.
The speed range of the motor required is, e.g. 0 ... 1500 rpm. A more accurate resolution can be obtained (e.g. a resolution of 1/20) by setting the face value factor to 1/20.

Face value num 1 **Face value den** 20

5.11.7 Programmable faults

DCVN series DC drives have extended monitoring functions. The effect of faults on the behavior of the DC drive is defined in the PROG ALARMS sub-menu.

- Save fault status
- Behaviour of the DC drive in the event of a fault
- Indication via the relays, earth terminals 35 and 36 (central alarm). The operational conditions of the relays may be defined using parameter **Ok relay func** in the CONFIGURATION menu.
- Automatic restart
- Fault acknowledgement

For certain alarms, the behavior of the DC drive can be configured separately. All alarms can be assigned to a programmable digital output.

Alarm	N.	Activity	Latch	Factory Open OK relay	Hold off time [ms]	Restart time [ms]	Standard
Failure Supply		Disable drive	ON	ON	-	-	-
Undervoltage		Disable drive	ON	ON	0	1000	Dig. Outp.7*
Overvoltage		Ignore	ON	ON	0	0	Dig. Outp.6*
Heatsink		Disable drive	-	ON	-	-	*
Overtemp motor		Disable drive	-	ON	-	-	*
External fault		Disable drive	ON	ON	100	0	*
Brake error		Disable drive	ON	ON	-	-	*
I2t overload		Disable drive	-	ON	-	-	*
Overcurrent		Ignore	ON	ON	0	0	Output.8*
Field loss		Disable drive	ON	ON	0	0	*
Speed fbk loss		Disable drive	-	ON	8	-	*
Opt 2 failure		Disable drive	ON	ON	-	-	*
Bus loss		Disable drive	ON	ON	0	0	*
Hw Opt 1 failure		Disable drive	-	ON	-	-	*
Enable seq err		Disable drive	ON	ON	-	-	

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* This function can be assigned to one of the programmable digital outputs.

If the serial interface or system bus is used, the alarms may be differentiated using parameter **Malfunction Code**. The parameters required to configure the alarm are given in the table in Chapter 8 of this guide.

Activity	Warning	The fault does not cause the DC drive to go into safety mode. A warning signal can be assigned to a digital output.
	Disable drive	The fault cause the DC drive to lock immediately and the brake control relay to drop out if the Lifting function is enabled. The motor stops in freewheel mode if it is not fitted with brakes.
	Quick stop	If a fault occurs, the drive stops progressively according to the ramp determined in the RAMP / QUICK STOP menu. The DC drive is then locked and if the lifting function is enabled, the brake control relay drops out.
	Normal stop	If a fault occurs, the DC drive stops gradually according to the determined ramp. The DC drive is then locked and if the lifting function is enabled, the brake control relay drops out.
	Curr lim stop	When an alarm occurs, the DC drive brakes with the maximum possible current and if the Lifting function is enabled, the brake control relay drops out simultaneously. The DC drive is then locked when the motor stops.

CONFIGURATION

Ignore — The fault message is displayed only. No other action is possible. The fault is acknowledged via RESET.

Note! No fault can cause a controlled shutdown of the drive.

The following table shows the options (Activity) available for dealing with each fault.

Alarm	Ignore	Warning	Disable drive	Quick stop	Normal stop	Curr lim stop
Failure Supply	-	-	X	-	-	-
Undervoltage	-	-	X	-	-	-
Overvoltage	X	X	X	-	-	-
Heatsink	-	X	X	X	X	X
Overtemp motor	X	X	X	X	X	X
External fault	-	X	X	X	X	X
Brake fault	X	X	X	X	X	X
I2t overload	X	X	X	-	-	-
Overcurrent	X	X	X	-	-	-
Field loss	X	X	X	-	-	-
Speed fbl loss	-	X	X	-	-	-
Opt 2 failure	-	-	X	X	X	X
Bus loss	X	X	X	X	X	X
Hw Opt 1 failure	-	X	X	X	X	X
Enable seq err	X	-	X	-	-	-

T6165

Latch ON — The fault is put into memory. Programmed actions are executed (e.g. open the OK relay) The status remains in memory even after the fault has been corrected. A fault acknowledgement command is required before the DC drive can be restarted.

OFF — The fault is not put into memory. Programmed actions are executed (e.g. open the OK relay) When the fault disappears, an acknowledgement is not required and the DC drive tries to restart by itself if its validation commands are present. If a fault appears with «Latch» = OFF, the display flashes.

Ok relay open ON — A fault causes the relay to drop out (earth terminals 35 and 36).

OFF — A fault does not cause the OK relay to drop out.

Failure supply

fault on the control circuit power supply.

Indicates a fault in the internal power supply of the regulation circuit.

The «Failure supply» message is displayed if there is no voltage at control circuit earth terminals U2 and V2 even if the DC drive is enabled. A digital output can be assigned to this fault. Normal acknowledgement may be carried out.

Undervoltage

Undervoltage on the power circuit supply.

When grid undervoltages occur, if the DC drive is locked (**Enable drive** = Enabled), the message «Undervoltage» appears. The DC drive is immediately locked. The undervoltage detection threshold is defined by means of the parameter **Undervolt thr**. If the fault is not held in memory (Latch = OFF), when the grid returns, the DC drive tries to restart automatically.

If the «Auto capture» function in the ADD SPEED FUNCT menu is active, the output from the ramp is fixed at the value corresponding to the actual speed allowing the motor to be restarted on the fly. This avoids a sudden possibly large speed jog on the motor and the associated system.

CONFIGURATION

Overvoltage

Armature overvoltage The fault appears when the armature voltage exceeds 20% of the value determined using parameter **Max out voltage**.

The «Auto capture» function, with its restrictions can also be applied in this case.

By default, this fault is ignored (Ignore). If management of this fault is enabled, the setting of **Max out voltage** must be checked.

Heatsink

Heatsink temperature too high

This fault always locks the DC drive 10 seconds after it is detected (Latch=ON)

An external controller (API etc.) can read this fault via a programmable digital output, RS485 serial link or Bus and can carry out a controlled shutdown in under 10 seconds.

Overtemp motor

Motor temperature too high (connection of a PTC probe: earth terminals 78/79).

External Fault

External fault (no voltage on terminal 15)

Brake fault

Mechanical brake fault.

- The DC drive has not managed to establish the selected torque within the time specified by the Brake max time parameter
- The brake feedback has not been received within the allotted time
- The brake feedback remains for 1 second after the closure order has been given to it.

I2t overload

This fault becomes active when the I2t accumulator parameter reaches 100%. If this is configured so as to lock the DC drive, then the armature current is not reduced when the type of overload control is configured in I2t mode.

Overcurrent

Overcurrent (short-circuit / ground fault). The fault appears when the armature current exceeds the threshold set using parameter **Overcurrent thr**.

Field loss

Energizing current too low. The fault appears when the energizing current is below 50% of the value set using parameter **Flux current min**. This alarm message is only enabled when the DC drive is unlocked (**Enable drive** = Enabled).

Speed fbk loss

Speed feedback absent.

When Activity = Warning in the CONFIGURATION/Speed fbk menu is chosen, parameter **Enable fbk bypass** must be configured as «Enabled», otherwise the motor reaches an uncontrolled speed.

Hold off time

Time delay between the detection of a fault and the activation of the programmed action. This parameter works like a filter. If the fault is still present when the time has elapsed, the programmed action is carried out.

Restart time

If **Latch**=Off and the fault situation it still there, even after the time defined by parameter **Restart time**, the fault is put into memory and it is not possible to carry out a restart.

Note! To acknowledge a fault in command mode, the validation and startup terminals on the terminal block must be at zero . The appearance of a fault is displayed on the keyboard. In mode «Latch» = ON, an acknowledgement command is required. This may be obtained by pressing the CANCEL key. If a second fault occurs before the first has been acknowledged, the text «Multiple failures» is displayed. In this case, acknowledgement can only be carried out using parameter **Failure reset** in the SPEC FUNCTIONS menu. Acknowledgement can then be carried out by pressing the ENT key with the DC drive locked.

Opt2 failure Fault on “Option 2” board.

Bus loss Fault in the connection to the field bus (only with the optional CANopen board).

Hw opt1 failure Fault on “Option 1” board.

Enable seq err Incorrect DC drive startup sequence. The correct sequence is as follows:

Case a: Main command = Terminal block

1 - Power up the DC drive control: terminal 12 (Enable drive) in any state
2 - Initialise DC drive: maximum time 5 seconds.
3 - End of initialization. Terminal 12 must be at zero.
4 - Time during which the Enable terminal must at zero: 1 sec.
5 - Unlock DC drive. Terminal 12 is in state 1.

If at the end of the initialization of the DC drive (phase 3) or during the 1 sec delay, terminal 12 is at state 1, an error is detected.

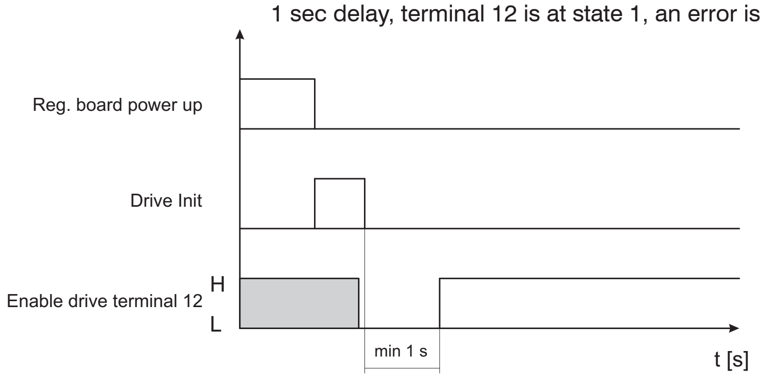


*Figure 5.11.7.1: DC drive unlocking sequence: **Main command**= terminals.*

Case b: **Main command** = Digital

1 - Power up the DC drive control: borne 12 (Enable drive) in any state.
2 - Initialise DC drive: maximum time 5 seconds.
3 - End of initialization.
4 - Time during which terminal 12 must at zero and **Enable Drive** [314] = Disabled (State 0): 1 sec. During this time Process Data Channel is initialized.
5 - Unlock DC drive: Terminal 12 is in state 1 and **Enable Drive** [314] = Enabled (State 1).

If at the end of the initialization of the DC drive (phase 3) or during the 1 sec delay, terminal 12 (Enable) is at state 1 and **Enable drive** [314] = Disabled (0), an error is detected.

CONFIGURATION

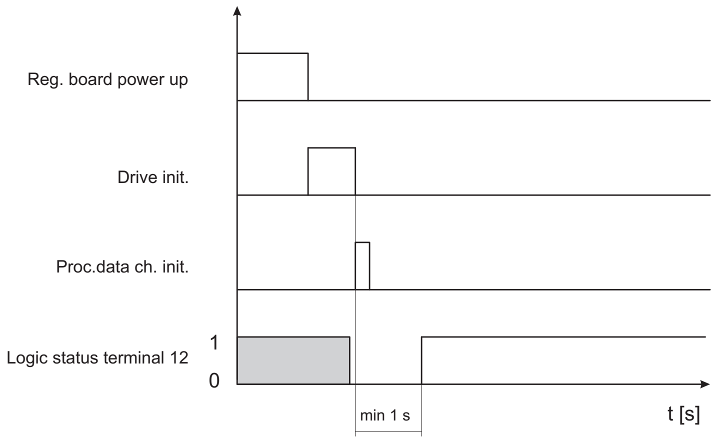


Figure 5.11.7.2: DC drive unlocking sequence: ***Main command*** *= Digital.*

In the event of a fault, the reset sequence is as follows:

Case a: **Latch** = ON

1 - Force terminal 12 to zero
2 - Force Enable drive [314] = Disable (0)
3 - If **Mains command** = Terminals, force terminal 13 (Start/Stop) to zero
4 - Carry out an acknowledgement command. The fault is acknowledged and the DC drive can work normally.

Case b: **Latch** = OFF

1 - Force terminal 12 to zero and **Enable Drive** [314] = Disabled (State 0) for at least 30 ms.
The fault is automatically acknowledged.

Note! In the event of a fault, the OK relay is influenced only if **OK relay funct** = Drive healthy. If **OK relay funct**= Ready to start, the DC drive will, however, be locked.

CONFIGURATION

5.11.8 Serial communication configuration (set serial comm)

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
CONFIGURATION \ Set serial comm										
Device address	319	U16	0	255	0		Yes	R/Z	-	-
Ser answer delay	408	U16	0	900	0		Yes	R/W	--	---
Ser protocol sel	323	U16	0	2	SLINK3		Yes	R/W	--	---
SLINK3					(0)			0		
MODBUS RTU								1		
JBUS								2		
Ser baudrate sel	326	U16	0	4	9600		Yes	R/W	--	---
19200								0		
9600					(1)			1		
4800								2		
2400								3		
1200								4		

Note: SLINK3 is the default communication protocol for the DC drive enabling communication with the optional DCVNCNF100 implementation and configuration software. The baud rate is fixed at 9600 for SLINK3.

The configuration modes of the serial communication are defined in the **Set serial comm** submenu.

Note! A change in protocol is only recognised by the DC drive when its control circuit is powered on again (Init) and the new protocol saved beforehand using the **Save parameters** command.

Device address The address of the DC drive is accessible if it is connected by means of the RS485 interface.

Ser answer delay Setting of the minimum delay between reception of the last byte by the DC drive and the start of its response. This delay avoids conflicts on the serial link if the RS485 interface of the master is not configured for automatic Tx/Rx switching.
The parameter is only relevant with the RS485 standard serial link.

Example: if the Tx/Rx switching delay for the master is set to the maximum of 20ms, the setting of parameter **Ser answer delay** will become slightly greater than 20ms: 22ms.

Ser protocol sel Serial protocol selection.

Ser baudrate sel Choice of transmission speed (baudrate) - except SLINK3

CONFIGURATION

5.11.9 Password

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
CONFIGURATION										
Pword 1	85	I32	0	99999	-		Yes	W	-	-

Passwords are available to the user to protect unauthorized access to parameters.

Pword 1 Protects the parameters entered by the user from unauthorized changes. It allows failure resets (**Failure reset**) and changes to the keyboard of the **Control mode** even if bus mode operation was selected (**Control mode**= Bus). The password can be freely defined by the user as a combination of 5 digits.

Activation of **Pword 1**:
- Select **Pword 1** in the CONFIGURATION menu
- Indicates if the password is active (Enabled) or not (Disabled)
- If not, press ENT and enter the password (see commissioning).
- Press ENT a second time. The keyboard indicates that the password is enabled (Enabled).
- The password change must be saved using the **Save parameters** command.

Proceed as follows to unlock **Pword 1**:
- Select **Pword 1** in the CONFIGURATION menu
- Indicates if the password is active (Enabled) or not (Disabled)
- If it is enabled, press ENT and enter the digit combination which forms the password
- press ENT again. The fact that the password is disabled is now displayed. (Disabled)
- This configuration must be saved using the **Save parameters** command so that the password remains disabled while the DC drive control is powered off then subsequently powered on.

When an incorrect password is entered, the message **Password wrong** is displayed.
When the DC drive signals a **EEPROM** fault, the password is deleted. This happens on the first recommissioning after a version change to the DC drive software.

When delivered, by default the Service menu of the DC drive is protected by password **Password 2**. No **Pword 1** has been entered. The user has access to all parameters. **Password 2** cannot be disabled.

Note! If password **Pword 1** has been forgotten it can be disabled using the universal password **51034**. This password is activated in the same way as described above.

5.12 I/O configuration

I/O CONFIGURATION Assignment of digital, analog and encoder inputs and outputs

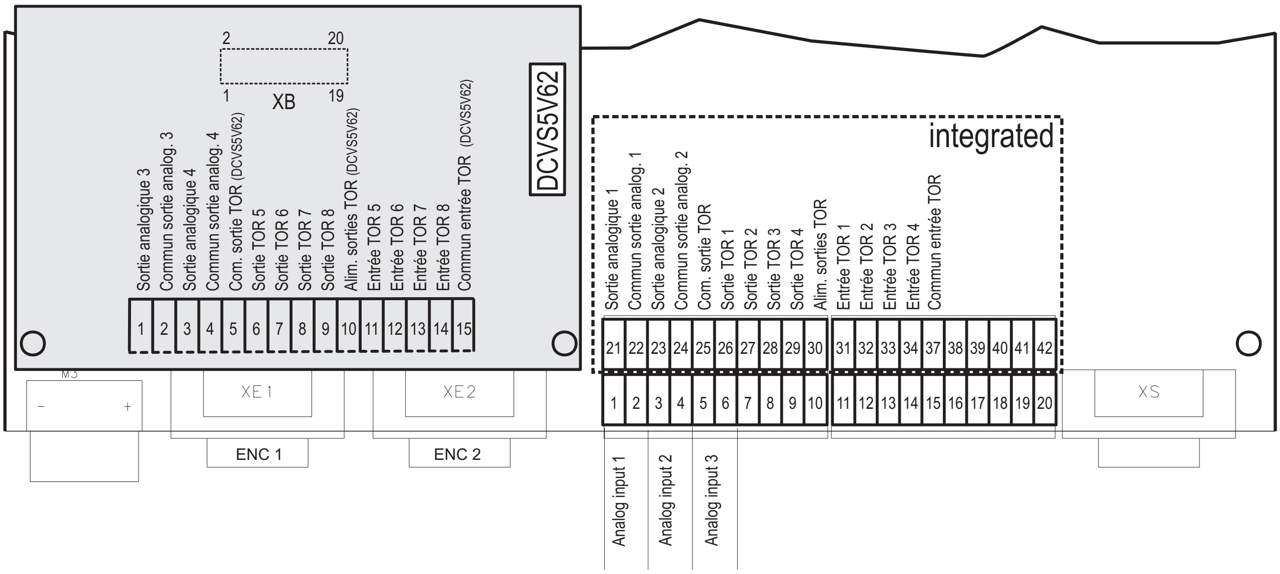


Figure 5.12.1: disposition of programmable inputs and outputs.

DCVN DC Drives give the option of assigning the input and output terminals to preselected functions. Apart from the earth terminals whose functions cannot be changed; the following terminal functions can be changed: Enable drive (12), Start (13) , Fast stop (14) and External fault (15) This can be carried out using the keyboard, the optional DCVNCNF100 implementation software or by using the optional CANopen DCVS5Z27 communication board The programmable inputs/outputs are factory-set to the most commonly required functions. However, these can be changed to the user's requirements.

Inputs/outputs are distributed on the DC drive as follows:

3 Differential analog inputs (1...3)
2 Analog outputs (1 and 2) with common reference point
4 Digital outputs (1...4) with common reference point and common voltage supply
4 Digital outputs (1...4) with common reference point.

When in addition to these, other digital and/or analog inputs/outputs are required, the optional DCVS5V62 board must be used and inserted into the DC drives control board. Only one DCVS5V62 board may be installed per DC drive (see figure):

Optional DCVS5V62 board:

2 Analog outputs (3 and 4) with common reference point
4 Digital outputs (5...8) with common reference point and common voltage supply
4 Digital outputs (5...8) with common reference point.

Note! If a parameter is assigned to a particular input, the value of the parameter (e.g. speed reference value) may not be input using the keyboard or by communication.

I/O CONFIGURATION

5.12.1 Analog Outputs

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
I/O CONFIG \ Analog outputs \ Analog output 1										
Select output 1	66	U16	0	93	Actual speed		Yes	R/Z	-	-
Scale output 1	62	Float	-10.000	+10000	0		Yes	R/W	-	
I/O CONFIG \ Analog outputs \ Analog output 2										
Select output 2 (Select like output 1)	67	U16	0	93	Motor current (16)		Yes	R/Z	-	-
Scale output 2	63	Float	-10.000	+10000	0		Yes	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 3										
Select output 3 (Select like output 1)	68	U16	0	93	Flux (27)	(F)	Yes	R/Z	-	-
Scale output 3	64	Float	-10.000	+10000	0		Yes	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 4										
Select output 4 (Select like output 1)	69	U16	0	93	Output voltage (20)	(F)	Yes	R/Z	-	-
Scale output 4	65	Float	-10.000	+10000	0		Yes	R/W	-	-

(F) = Optional DCVS5V62 board must be present.

Select output XX Assigned parameter selected as variable to the corresponding analog output. The following assignments may be made:

OFF 1) [0]
Speed ref 1 1) [1]
Speed ref 2 1) [2]
Ramp ref 1 1) [3]
Ramp ref 2 1) [4]
Ramp ref 1) [5]
Speed ref 1) [6]
Ramp Output 1) [7]
Actual speed (rpm) 1) [8]
T current ref 1 2) [9]
T current ref 2 2) [10]
T current ref 2) [11]
Speed reg out 2) [15]
Motor current 2) [16]
Output voltage 3) [20]
Analog Input 1 4) [24]
Analog Input 2 4) [25]
Analog Input 3 4) [26]
Flux current 5) [27]
Pad 0 6) [31]
Pad 1 6) [32]
Pad 4 6) [33]
Pad 5 6) [34]
Flux reference 7) [35]
Pad 6 6) [38]
PID Output 6) [39]
Out vlt level 3) [79]
Flux current max 5) [80]
F act spd (rpm) 1) [81]
F T curr (%) 2) [82]
Spd draw out 9) [84]
Output power 10) [88]
Roll diameter [89]
Act tension ref [90]
Torque current [91]
W reference [92]
Actual comp [93]
Brake current [94]

I/O CONFIGURATION

1) With a calibration factor of 1, the output provides 10V when the reference value or speed corresponds to the value defined by **Speed base value**.

2) With a calibration factor of 1, the output provides 10V when the reference or the current corresponds to the rated armature current I_{dN}.

3) With a calibration factor of 1, the output provides 10V when the voltage corresponds to the value in volts defined in the parameter **Max out voltage**.

4) With a calibration factor of 1, the output provides 10V when the voltage reaches 10V on the analog input (where the scaling factor and **Tune value** of the input = 1). See figure 5.12.1.1

5) With a calibration factor of 1, the output provides 10V when the energizing current corresponds to **Nom flux curr**.

6) With a calibration factor of 1, the output provides 10V when the value of the word is 2047.

7) With a calibration factor of 1, the output provides 10V when the energizing current reference corresponds to **Nom flux curr**.

8) For maximum full scale values, refer to Chapter 5.16.3 **Function PID**.

9) With a calibration factor of 1, the output provides 10V when the value of **Speed ratio** is equal to 20000.

10) With a calibration factor of 1, the output provides 5V to the rated power given by: **Full load current * Max out voltage**.

Scale output XX Calibration of the analog output concerned

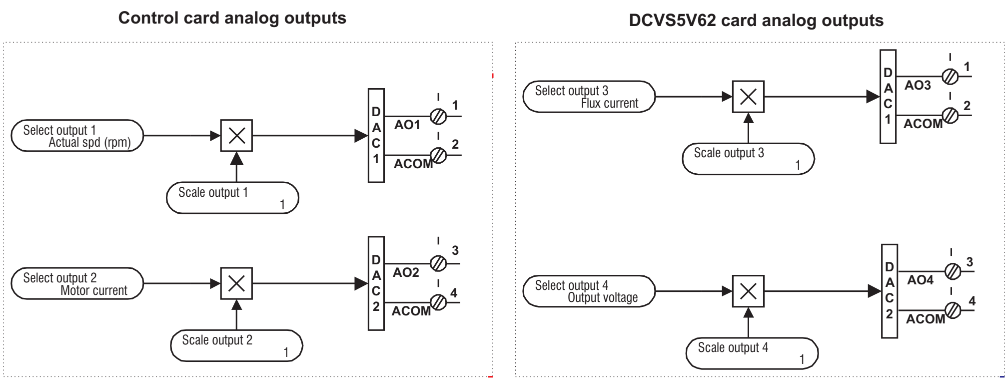


Figure 5.12.1.1: Functional diagram of analog outputs.

Example of estimation of calibration factor **Scale output xx**

You have a device with a digital display showing you the drive speed. The instrument has a measuring range from 0 to 2 V.
This means that at maximum speed, a maximum voltage of 2V is required at the DC drive's analog output. A calibration factor of 1 provides 10V (see note 1).
Calibration factor = 2 V / 10 V = 0.200

Note! Using a DCVN104 DC drive (4 quadrants), the analog output provides a dual polarity voltage of +/- 10V

I/O CONFIGURATION

5.12.2 Analog Inputs

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
I/O CONFIG \ Analog inputs \ Analog input 1										
Select input 1	70	U16	0	31	Ramp	Term. 1/2	Yes	R/Z	-	-
An in 1 target Not assigned Assigned	295	U16	0	1	0		Yes	R/W 1 0	ID H L	R/W 1 0
Input 1 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	71	U16	0	2	± 10 V		Yes	R/Z 0 1 2	-	-
Input 1 sign Positive Negative	389	U16	0	1	1	(E)	Yes	R/W 1 0	-	R/W 1 0
Scale input 1	72	Float	-10.000	10.000	1.000		Yes	R/W	-	-
Tune value inp 1	73	Float	0.100	10.000	1.000		Yes	R/W	-	-
Auto tune inp 1 Auto tune	259	U16					Yes	C/W 1	-	-
Input 1 filter [ms]	792	U16	0	1000	0		Yes	R/W	-	R/W
Input 1 compare	1042	I16	-10000	+10000	0		Yes	R/W	-	-
Input 1 cp error	1043	U16	0	10000	0		Yes	R/W	-	-
Input 1 cp delay	1044	U16	0	65000	0		Yes	R/W	-	-
Input 1 cp match Input 1=thr.val. Input 1 not thr.val.	1045	U16	0	1	-	(D)	-	R 1 0	QD H L	R
Offset input 1	74	I16	-32768	+32767	0		Yes	R/W	-	-
I/O CONFIG \ Analog inputs \ Analog input 2										
Select input 2 (Select like Input 1)	75	U16	0	31	OFF (0)	Term. 3/4	Yes	R/Z	-	-
An in 2 target Assigned Not assigned	296	U16	0	1	0		Yes	R/W 0 1	ID L H	R/W 0 1
Input 2 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	76	U16	0	2	± 10 V		Yes	R/Z 0 1 2	-	-
Input 2 sign Positive Negative	390	U16	0	1	1	(E)	Yes	R/W 1 0	-	R/W 1 0
Scale input 2	77	Float	-10.000	10.000	1.000		Yes	R/W	-	-
Tune value inp 2	78	Float	0.100	10.000	1.000		Yes	R/W	-	-
Auto tune inp 2 Auto tune	260	U16					Yes	C/W 1	-	-
Offset input 2	79	I16	-32768	+32767	0		Yes	R/W	-	-

5.12 I/O configuration

I/O CONFIGURATION

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
I/O CONFIG \ Analog inputs \ Analog input 3										
Select input 3 (Select like Input 1)	80	U16	0	31	OFF (0)	Term. 5/6	Yes	R/Z	-	-
An in 3 target Not assigned Assigned	297	U16	0	1	0		Yes	R/W 1 0	ID H L	R/W 1 0
Input 3 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	81	U16	0	2	± 10 V		Yes	R/Z 0 1 2	-	-
Input 3 sign Positive Negative	391	U16	0	1	1	(E)	Yes	R/W 1 0	-	R/W 1 0
Scale input 3	82	Float	-10.000	10.000	1.000		Yes	R/W	-	-
Tune value inp 3	83	Float	0.100	10.000	1.000		Yes	R/W	-	-
Auto tune inp 3 Auto tune	261	U16					Yes	C/W 1	-	-
Offset input 3	84	I16	-32768	+32767	0		Yes	R/W	-	-

(D) = This parameter can be assigned to a programmable digital output.
(E) = This parameter may be assigned to a programmable digital input.

Select input XX Select parameter whose value is to be assigned to an analog input. The following assignments may be made:

OFF [1)] [0]	T current limit [2)] [9]	PI central v3 [4)] [22]
Jog reference [1)] [1]	T current lim + [2)] [10]	PID feed-back [4)] [23]
Speed ref 1 [1)] [2]	T current lim - [2)] [11]	Flux current max [25]
Speed ref 2 [1)] [3]	Pad 0 [3)] [12]	Out vit level [26]
Ramp ref 1 [1)] [4]	Pad 1 [3)] [13]	Speed ratio [28]
Ramp ref 2 [1)] [5]	Pad 2 [3)] [14]	Tension red [29]
T current ref 1 [2)] [6]	Pad 3 [3)] [15]	Tension ref [30]
T current ref 2 [2)] [7]	Load comp [19]	Preset 3 [31]
Adap reference [1)] [8]	PID Offset 0 [4)] [21]	Brake ref [32]

[1)] With a calibration factor of 1 and **Tune value inp XX** = 1, 10 V or 20 mA on the input, corresponds to **Speed base value**.

[2)] With a calibration factor of 1 and **Tune value inp XX** = 1, 10 V or 20 mA on the input, corresponds to maximum possible armature current.

[3)] With a calibration factor of 1, 10V or 20 mA on the input, corresponds to the word value of 2047.

[4)] For maximum full scale values, refer to Chapter 5.16.3 **Function PID.**

[5)] With a calibration factor of 1.0 and **Tune value inp XX** = 1, 10 V or 20 mA corresponds to **Speed ratio** = 20000.

An in XX target Enables the assignment of the analog input.

Input XX type Selects input type (input current or voltage)

I/O CONFIGURATION

The jumpers on the control board must be adapted according to the nature of the input signals used. The analog inputs of the DC drive are factory-configured for voltage signals.

ON = jumper installed OFF = no jumper

Analog input	Input signal -10 V ... + 10 V / 0 - 10 V	Input signal 0 - 20 mA / 4 - 20 mA
Analog input 1	S9 = OFF	S9 = ON
Analog input 2	S10 = OFF	S10 = ON
Analog input 3	S11 = OFF	S11 = ON

T6185f-en

-10 V...+10 V A maximum voltage of ±10 V is applied to the analog input concerned. If the signal is used as a reference value, a reverse polarity can be used to reverse the direction of rotation of the drive (only with DCVN104 DC drives). DCVN94 DC drives only accept positive speed references. Negative references are not recognized and the DC drive does not start up.

0-10V, 0-20mA A maximum voltage of 10 V or a current signal of 0...20 mA is applied to the analog input concerned. This signal must be positive. If the signal is used as a reference value for DCVN104 DC drives, the direction of rotation may be reversed using the **Input XX sign +** and **Input XX sign -** parameters.

4-20 mA A current signal of 4...20 mA is applied to the analog input concerned. This signal must be positive. If the signal is used as a reference value for DCVN104 DC drives, the direction of rotation may be reversed using the **Input XX sign +** and **Input XX sign -** parameters.

Input XX sign Selects direction of rotation using the serial link or CANopen bus for DCVN104 four-quadrant DC drives.

Input XX sign + Selects clockwise rotation by command to the terminal block for DCVN104 DC drives when the reference value is only given with one polarity.
State 1 Clockwise direction selected
Status 0 Clockwise direction not selected.

Input XX sign - Selects anti-clockwise rotation by command to the terminal block for DCVN104 DC drives when the reference value is only given with one polarity.
Status 1 Anticlockwise direction selected
Status 0 Anti-clockwise direction not selected.

Scale input XX Calibration of the corresponding analog input

Example: The reference value of the speed of an DC drive is defined using an external voltage of 5V. With this value, the DC drive should reach the maximum allowed speed (implemented using Speed base value).

I/O CONFIGURATION

With the **Scale input XX** parameter, the calibration factor has the value 2 (10V: 5V).

Tune value inp XX Precise setting of the input when the maximum signal does not correspond exactly to the fixed value. See the example below.

Example: An external analog reference only reaches a maximum of 9.8V instead of 10V. With the **Tune value inp XX** parameter, the calibration factor has the value 1,020 (10V: 9.8V).

The same result can be obtained using the Auto tune inp XX function described below. Suitable parameters having been entered in the menu using the keyboard, the maximum analog value (in this case 9.8V) being present on the earth terminals with a positive polarity.

When the function is enabled using the «ENT» key, the input is self-tuned.

Auto tune inp XX Automatic precise setting. If this command is given, **Tune value inp XX** is automatically selected such that the input signal corresponds to the maximum variable value such as **Speed base value**. Two conditions are required for precise automatic calibration:

- Input voltage greater than 1V or input current greater than 2mA
- Positive polarity The value found is automatically calculated for the anti-clockwise direction for DCVN104 DC drives.

Note: The value calculated automatically can be, if necessary changed manually using **Tune value inp XX**.

Input 1 filter Filters on the measurement from analog input 1.

Offset inp XX If the analog signal has an offset or if the variable assigned to the input already has a value in spite of the absence of an input signal, this can be compensated by **Offset inp XX**.

The DC drive is factory-set with the following analog values: +10V/-10V. If a parameter is already assigned internally, (e.g. if **Speed ref 1** is automatically connected to the output ramp when the ramp is enabled) it will no longer be shown in the List of parameters able to be assigned to an analog input.

Parameters **Input XX sign +** and **Input sign -** cannot be sent via a serial link!

I/O CONFIGURATION

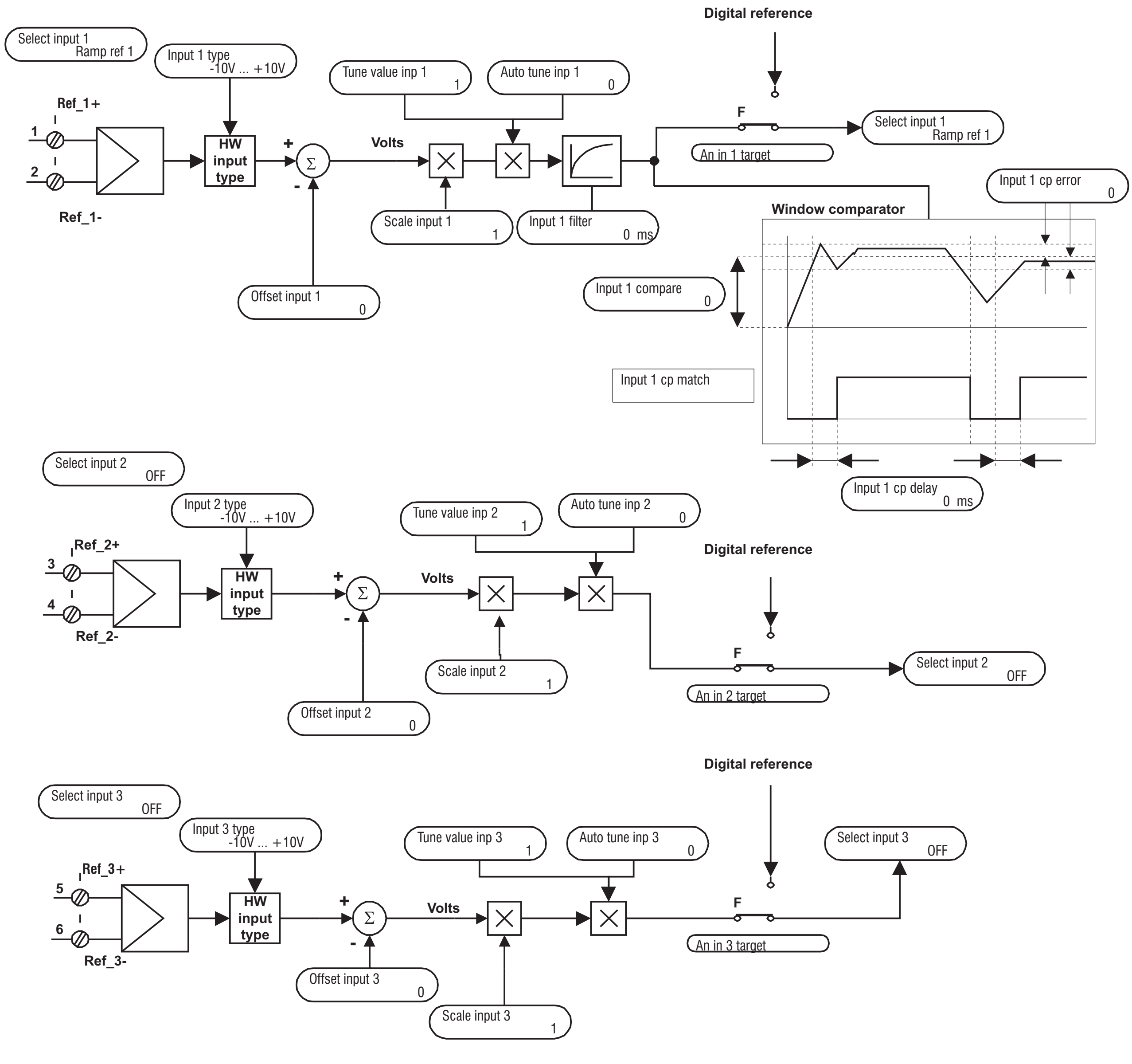


Figure 5.12.2.1: Analog inputs.

Hysteresis comparator on "Analog Input 1".

This function is used to associate the variable Input 1 cp match to a reference value detection window on analog input window 1.

Input 1 compare Comparison threshold.

Input 1 cp error Tolerance range around **Input 1 compare**.

Input 1 cp delay Adjustable time delay in milliseconds for **Input 1 cp match** moving from status 0 to status 1.

I/O CONFIGURATION

Input 1 cp match The reference is within the tolerance range. This parameter can be read using the serial link or digital output assigned to this parameter.

Status 1 The value of **Analog input 1** is inside the tolerance range.

Status 0 The value of **Analog input 1** is outside the tolerance range.

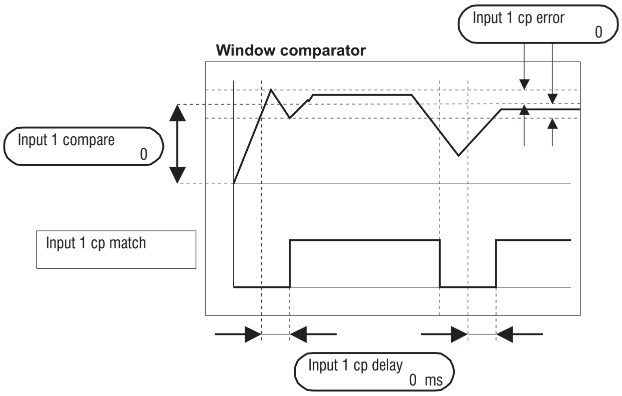


Figure 5.12.2.2: Window comparator.

Note! The values of parameters **Input 1 compare** and **Input 1 cp error** are calculated as follows:

Input 1 compare = (Comparison value) * 10000 / (Total value of field)

Input 1 error = (Half of the tolerance value) * 10000 / (Total value of the field)

Example 1:

Select analog input 1 = **Ramp ref 1**
Speed base value =1500 [rpm]
10 Volt or 20 mA on **Analog Input 1** (**Ramp ref 1= Speed base value**).
The application requires a signal at 700 [rpm] through a digital output with a tolerance equal to 100 [rpm].
Input 1 cp match assigned to a programmable digital output.
Input 1 compare = 700 * 10000 / 1500 = 4667
Input 1 cp error = 100 * 10000 / 1500 = 666

Example 2:

Select analog input 1 = **Ramp ref 1**
Speed base value =1500 [rpm]
10 Volt or 20 mA on **Analog Input 1** (**Ramp ref 1= Speed base value**).
The application requires a signal at -700 [rpm] through a serial link with a tolerance equal to ±100 [rpm].
Input 1 compare = -700 * 10000 / 1500 = -4667
Input 1 cp error = 100 * 10000 / 1500 = 666

I/O CONFIGURATION

Example 3:

Select analog input 1 = **Pad 0**
10 Volt or 20 mA on **Analog Input 1** corresponds to **Pad 0= 2047**.
The application requires a signal at 700 [points] through a digital output with a tolerance equal to ±50 [points]
Input 1 cp match assigned to a programmable digital output.
Input 1 compare = 700 * 10000 / 2047 = 3420
Input 1 cp error = 50 * 10000 / 2047 = 244

Example 4:

Select analog input 1 = **PID feedback**
10 Volt or 20 mA on **Analog Input 1** corresponds to **PID feedback= 10000 [points]**.
The application requires a signal at 4000 [points] through a digital output with a tolerance equal to ±1000 [points]
Input 1 cp match assigned to a programmable digital output.
Input 1 compare = 4000 * 10000 / 10000 = 4000
Input 1 cp error = 1000 * 10000 / 10000 = 1000

Example 5:

Select analog input 1 = **T current lim**
10 Volt or 20 mA on **Analog Input 1** corresponds to **T current lim = 100 [%]**
The application requires a signal at a value of 50[%] through a digital output with a tolerance equal to ±2 [%]
Input 1 cp match assigned to a programmable digital output.
Input 1 compare = 50 * 10000 / 100 = 5000
Input 1 cp error = 2 * 10000 / 100 = 200

I/O CONFIGURATION

5.12.3 Digital Outputs

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
I/O CONFIG \ Digital outputs										
Digital output 1	145	U16	0	61	Ramp +		Yes	R/Z	-	-
Inversion out 1 Enabled Disabled	1267	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital output 2 (Select like output 1)	146	U16	0	61	Ramp - (9)		Yes	R/Z	-	-
Inversion out 2 Enabled Disabled	1268	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital output 3 (Select like output 1)	147	U16	0	61	Spd thr. (2)		Yes	R/Z	-	-
Inversion out 3 Enabled Disabled	1269	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital output 4 (Select like output 1)	148	U16	0	61	Overld avail. (6)		Yes	R/Z	-	-
Inversion out 4 Enabled Disabled	1270	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital output 5 (Select like output 1)	149	U16	0	61	Curr lim. State (4)		Yes	R/Z	-	-
Inversion out 5 Enabled Disabled	1271	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital output 6 (Select like output 1)	150	U16	0	61	Overvolt (12)		Yes	R/Z	-	-
Inversion out 6 Enabled Disabled	1272	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital output 7 (Select like output 1)	151	U16	0	61	Undervolt(11)		Yes	R/Z	-	-
Inversion out 7 Enabled Disabled	1273	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital output 8 (Select like output 1)	152	U16	0	61	Overcurr (14)		Yes	R/Z	-	-
Inversion out 8 Enabled Disabled	1274	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Relay 2 (Select like output 1)	629	U16	0	61	Stop ctrl (23)		Yes	R/Z	-	-
Inversion relay 2 Enabled Disabled	1275	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-

I/O CONFIGURATION

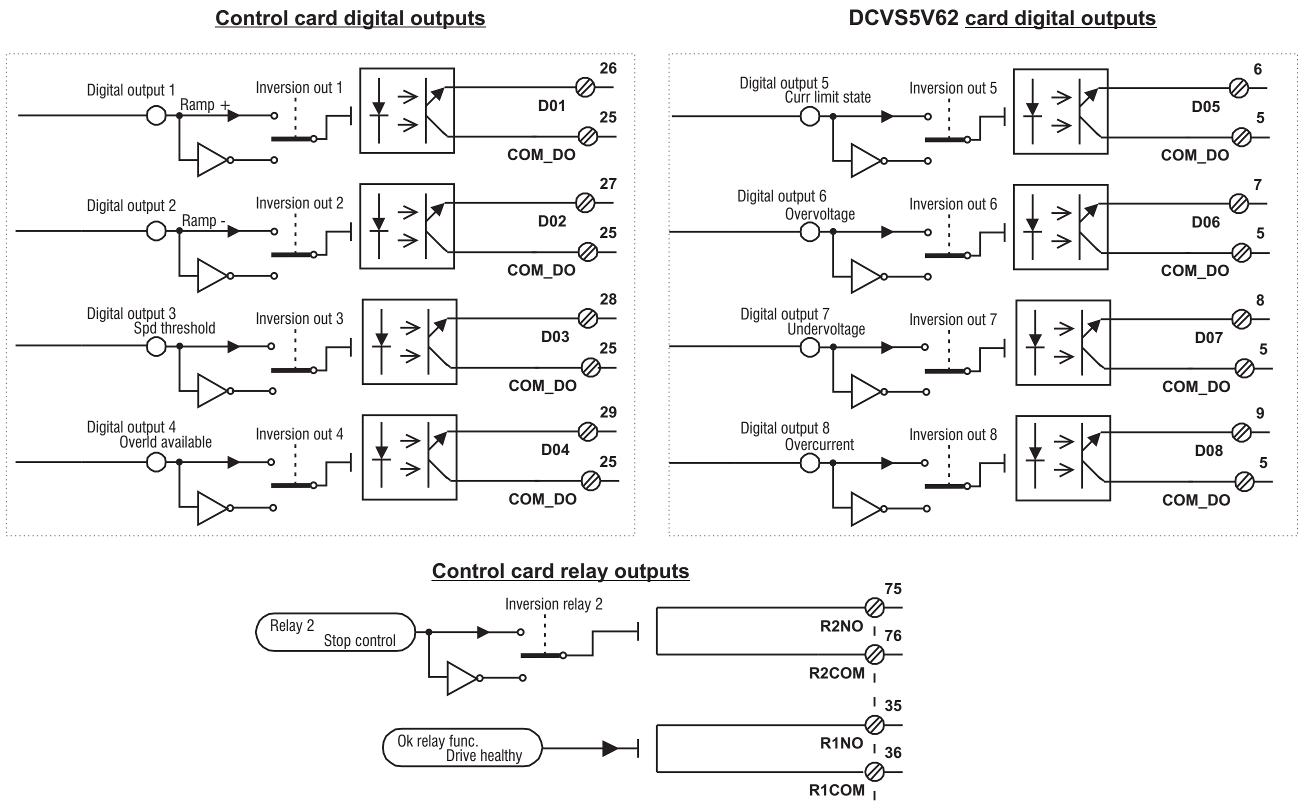


Figure 5.12.3.1: Digital outputs.

Digital output XX Selection of parameter which is assigned to the digital output concerned.

The following assignments may be made:

OFF [0]	Overcurrent [14]]	Encoder 1 state [30]
Speed zero thr [1]	Overtemp motor [15]	Encoder 2 state [31]
Spd threshold [2]	External fault [16]	Enable seq err [35]
Set speed [3]	Failure supply [17]	Diameter calc st *) [38]
Curr limit state [4]	Pad A bit [18]	Input 1 cp match [49]
Drive ready [5]	Pad B bit [19]	Diam reached [58]
Overld available [6]	Virt dig input [20]	Spd match compl [59]
Overload state [7]	Torque sign [21	Acc state [60]
Ramp + [8]	Stop control [23]	Dec state [61]
Ramp - [9]	Field loss [24]	Brake command [62]
Speed limited [10]	Speed fbk loss [25]]	Brake failure [63]
Undervoltage [11]	BUS loss [26]	ChangeSetup [64]
Overvoltage [12]	Hw opt1 failure [28]	Ovrld prealarm[65]
Heatsink [13]	Opt2 failure [29]	I2t ovrld failure [66]

*) = See Chapter 5.16.3 **PID Function**

Inversion out XX With these parameters, it is possible to reverse the logic of the digital outputs.

Relay 2 Selection of parameters which can be assigned to relay 2 (ground terminals 75 and 76).

Note! With regard to the retrieval logic on relay failures:

Output = Relay contact down and open: Failure

Output = Relay contact up and closed: No failure

I/O CONFIGURATION

5.12.4 Digital Inputs

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
I/O CONFIG \ Digital inputs										
Digital input 1	137	U16	0	83	OFF		Yes	R/Z	-	-
Inversion in 1 Enabled Disabled	1276	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital input 2 (Select like input 1)	138	U16	0	83	OFF (0)		Yes	R/Z	-	-
Inversion in 2 Enabled Disabled	1277	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital input 3 (Select like input 1)	139	U16	0	83	OFF (0)		Yes	R/Z	-	-
Inversion in 3 Enabled Disabled	1278	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital input 4 (Select like input 1)	140	U16	0	83	OFF (0)		Yes	R/Z	-	-
Inversion in 4 Enabled Disabled	1279	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital input 5 (Select like input 1)	141	U16	0	83	OFF (0)		Yes	R/Z	-	-
Inversion in 5 Enabled Disabled	1280	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital input 6 (Select like input 1)	142	U16	0	83	OFF (0)		Yes	R/Z	-	-
Inversion in 6 Enabled Disabled	1281	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital input 7 (Select like input 1)	143	U16	0	83	OFF (0)		Yes	R/Z	-	-
Inversion in 7 Enabled Disabled	1282	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Digital input 8 (Select like input 1)	144	U16	0	83	OFF (0)		Yes	R/Z	-	-
Inversion in 8 Enabled Disabled	1283	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-

5.12 I/O configuration

I/O CONFIGURATION

Control card digital inputs **DCVS5V62 card digital inputs**

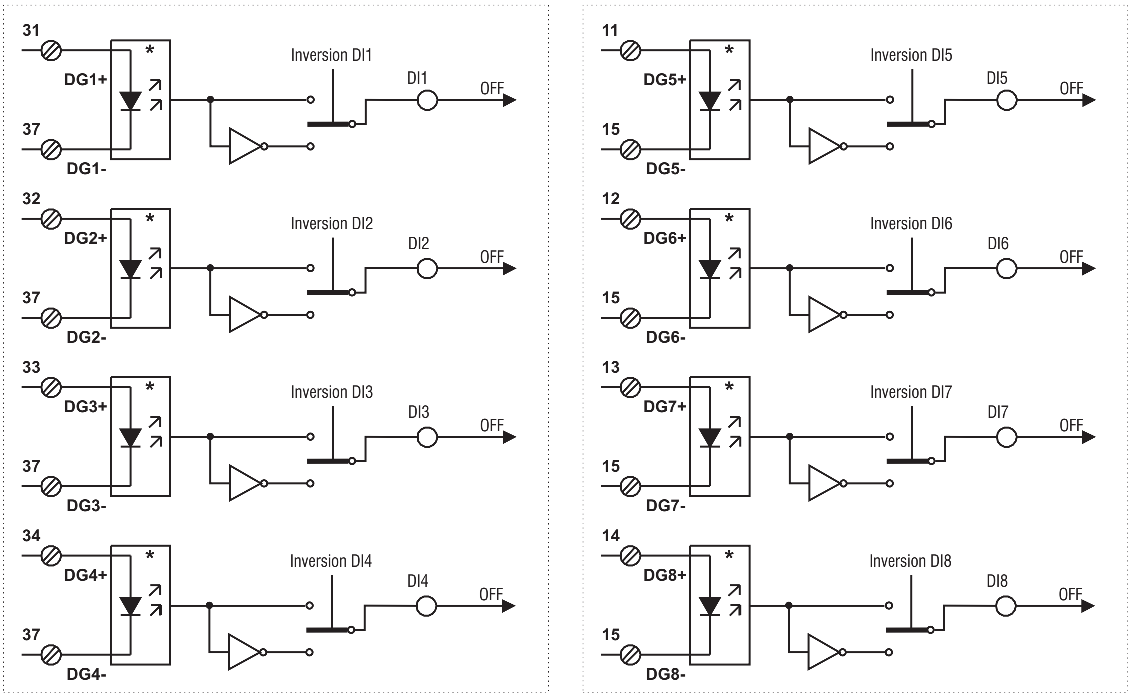


Figure 5.12.4.1: Digital inputs.

Digital input XX Selection of parameter assigned to the digital input concerned. The following assignments may be made:

OFF [0]
Motor pot reset [1]
Motor pot up [2]
Motor pot down [3]
Motor pot sign +[4]
Motor pot sign - [5]
Jog +[6]
Jog - [7]
Failure reset [8]
Torque reduct [9]
Ramp out = 0 [10]
Ramp in = 0 [11]
Freeze ramp [12]
Lock speed reg [13]
Lock speed I [14]
Auto capture [15]
Input 1 sign +[1] [16]
Input 1 sign - [1] [17]
Input 2 sign +[1] [18]
Input 2 sign - [1] [19]
Input 3 sign + [1] [20]
Input 3 sign - [1] [21]
Zero torque [22]
Speed sel 0 [23]
Speed sel 1 [2] [24]
Speed sel 2 [2] [25]
Ramp sel 0 [3] [26]
Ramp sel 1 [3] [27]
Field loss [29]
Enable flux reg [30]
Enable flux weak [31]
Pad A bit 0 [32]
Pad A bit 1 [33]
Pad A bit 2 [34]
Pad A bit 3 [35]
Pad A bit 4 [36]
Pad A bit 5 [37]
Pad A bit 6 [38]
Pad A bit 7 [39]
Forward sign [44]
Reverse sign [45]
An in 1 target [46]
An in 2 target [47]
An in 3 target [48]
Enable droop [49]
Enable PI PID [4] [52]
Enable PD PID [4] [53]
PI integral freeze [4] [54]
PID offs. Sel [4] [55]
PI central vs0 [4] [56]
PI central vs1 [4] [57]
Diameter calc [4] [58]
Diam reset [68]
Diam calc Dis [69]
Torque winder EN [70]
Line acc status [71]
Line dec status [72]
Line fstp status [73]
Speed match [74]
Diam inc/dec En [75]
Wind/unwind[76]
Diam preset sel0 [77]
Diam preset sel1 [78]
Taper enable [79]
Speed demand En [80]
Winder side [81]
Enable PI-PD PID [82]
Jog TW enable [83]
Brake fbk [84]
Setup1/Setup2 [85]

1) Parameters **Input xx sign** + and **Input XX sign -** can only be used together.

2) Parameters **Speed sel 0**, **Speed sel 1** and **Speed sel 2** can only be used together. (see 5.14.3).

3) Parameters **Ramp sel 0** and **Ramp sel 1** can only be used together. (see 5.14.4).

4) See paragraph 5.16.3 **PID Function.**

Inversion in XX With these parameters, it is possible to reverse the logic of the digital inputs.

I/O CONFIGURATION

5.12.5 Speed reference from an encoder (Tach. feed. function)

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	RS	Term	D/P
I/O CONFIG \ Encoder inputs										
Select enc 1	1020	U16	0	5	OFF		Yes	R/Z	-	-
OFF					(0)			0		
Speed ref 1								2		
Speed ref 2								3		
Ramp ref 1								4		
Ramp ref 2								5		
Select enc 2	1021	U16	0	5	OFF		Yes	R/Z	-	-
OFF					0			0		
Speed ref 1								2		
Speed ref 2								3		
Ramp ref 1								4		
Ramp ref 2								5		
Encoder 1 pulses	416	Float*	600	9999	1024		Yes	R/Z	-	R
Encoder 2 pulses	169	Float*	150	9999	1024		Yes	R/Z	-	R
Refresh enc 1	649	U16	0	1	Disabled		Yes	R/W	-	-
Enabled								1		
Disabled					(0)			0		
Refresh enc 2	652	U16	0	1	Disabled		Yes	R/W	-	-
Enabled								1		
Disabled					(0)			0		

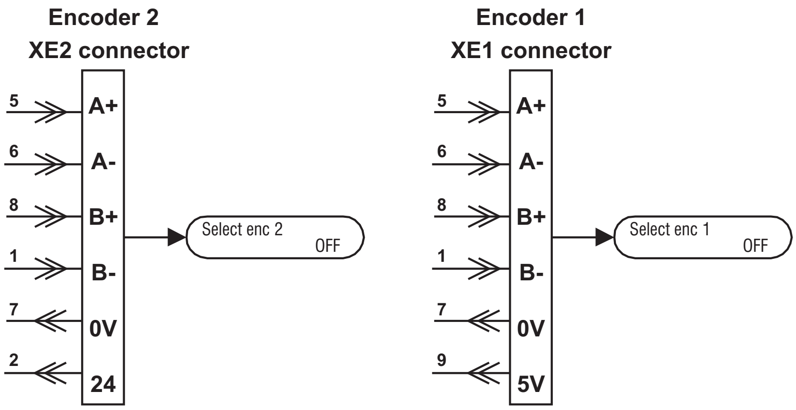


Figure 5.12.5.1: Encoder reference.

This configuration enables the Encoder inputs to be used as speed reference.
Compared to an analog-type input, these inputs show a resolution and immunity to a high interference levels.
When using encoder inputs (connectors XE1 or XE2), it is necessary to define the destination of the reference speed with which they are to be associated (**Ramp ref 1**, **Speed ref 1**, etc.).

5.12 I/O configuration

I/O CONFIGURATION

Notes! When the encoder is used as speed feedback, it is not possible to use the encoder input as speed reference.

The same reference speed selection cannot be configured on the encoder input and an analog input at the same time.

When the encoder input is not configured as speed feedback, this input can still not be used as speed reference.

The allowable configurations are listed in the following table:

Speed fbk sel [414]	Encoder 1 as reference	Encoder 2 as reference
Encoder 1	Not available	Not available
Encoder 2	Available	Not available
Tacho	Not available	Available
Armature	Available	Available

T0727f-en

WARNING! The DC drive accepts all configurations. The user must comply with the configurations shown in this table.

Select enc 1 (2) Choice of destination parameter to which encoder inputs 1 or 2 refer. The OFF state indicates that the encoder is not used as speed reference and that it can therefore be used as speed feedback (menu CONFIGURATION/Speed fbk sel).

The choice of the destination of the speed reference must be made in compliance with the DC drive configuration (for example **Speed ref 1** cannot be used with an active ramp).

Encoder 1 (2) pulses Number of pulses per revolution for encoders 1 or 2.

Note! Take care not to exceed a frequency of 150 KHz on encoder inputs!

Refresh enc 1 (2) Activation of the test which notes the presence of signals A, B, Aneg, Bneg on encoder 1 or 2.

5.13 Add speed function

ADD SPEED FUNCTION Auto Capture, Adaptive spd reg, speed thresholds

5.13.1 Auto capture

The Auto capture function allows the DC drive to restart a motor on the fly.

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
ADD SPEED FUNCT										
Auto capture	388	U16			OFF	(E)	Yes	R/W	ID	-
ON								1	H	
OFF					0			0	L	

(E) = This parameter may be assigned to a programmable digital input.

Auto capture ON When the DC drive is switched on, the motor speed is measured and the ramp output automatically adjusted accordingly. The DC drive then runs to the set reference value.

OFF When the DC drive is switched on, the ramp starts from zero.

Main uses:

- Connection of the DC drive to a motor that is already turning due to its load (e.g. pumps).
- Restarting after a failure.
  If the speed reference is defined with the ramp and **Auto capture** = ON, it starts at a reference value corresponding to the speed of the motor.

Note! If the Auto capture function is not enabled, ensure that the motor is not turning when the DC drive is switched on. Otherwise, this can cause sudden deceleration of the motor due to current limitation.

ADD SPEED FUNCTION

5.13.2 Adaptive spd reg

The adaptive speed regulator function allows different speed regulator gains, depending on the speed or another variable (**Adap reference**). This allows optimal adaptation of the speed regulator to the application.

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
ADD SPEED FUNCT \ Adaptive spd reg										
Enable spd adap Enabled Disabled	181	U16	0	1	Disabled (0)	(C)	Yes	R/Z 1 0	-	-
Select adap type Adap reference Speed	182	U16	0	1	Speed		Yes	R/Z 1 0	-	-
Adap reference	183	I16	-32768	+32767	1000		Yes	R/W	IA	R/W
Adap speed 1 [%]	184	Float	0.0	200.0	20.3		Yes	R/W	-	-
Adap speed 2 [%]	185	Float	0.0	200.0	40.7		Yes	R/W	-	-
Adap joint 1 [%]	186	Float	0.0	200.0	6.1		Yes	R/W	-	-
Adap joint 2 [%]	187	Float	0.0	200.0	6.1		Yes	R/W	-	-
Adap P gain 1 [%]	188	Float	0.00	100.00	10.00		Yes	R/W	-	-
Adap I gain 1 [%]	189	Float	0.00	100.00	1.00		Yes	R/W	-	-
Adap P gain 2 [%]	190	Float	0.00	100.00	10.00		Yes	R/W	-	-
Adap I gain 2 [%]	191	Float	0.00	100.00	1.00		Yes	R/W	-	-
Adap P gain 3 [%]	192	Float	0.00	100.00	10.00		Yes	R/W	-	-
Adap I gain 3 [%]	193	Float	0.00	100.00	1.00		Yes	R/W	-	-

Enable spd adap
- Enabled: Adaptive speed regulator function enabled.
- Disabled: Function not enabled. The regulator operates with the parameters set in the REG PARAMETERS menu.

Select adap type
- Speed: The parameters of the regulator are modified according to the speed.
- Adap reference: The parameters of the regulator are modified according to the **Adap reference** parameter.

Adap reference Value of the parameter according to which the speed regulator parameters are modified (only where **Select adap type** = Adap reference).

Adap speed 1 The first set of parameters (**Adap P gain 1, Adap I gain 1**) is valid below the **Adap speed 1** threshold, the second set of parameters (**Adap P gain 2, Adap I gain 2**) is valid above this threshold. The transition behaviour between the values is defined by the **Adap joint 1** parameter. The definition is expressed as a % of **Speed base value** or the maximum value of **Adap reference**.

Adap speed 2 The second set of parameters (**Adap P gain 2, Adap I gain 2**) is valid below the **Adap speed 2** threshold. The third set of parameters (**Adap P gain 3, Adap I gain 3**) is valid above this threshold. The transition between the values is defined by the **Adap joint 2** parameter. The definition is expressed as a % of **Speed base value** or the maximum value of **Adap reference**.

Adap joint 1 Defines a range around **Adap speed 1** where there is a linear change in gains from set 1 to set 2 to avoid jogging of the speed regulator.

5.13 Add speed function

ADD SPEED FUNCTION

Adap joint 2	Defines a range around **Adap speed 2** where there is a linear change in gains from set 2 to set 3 for the same reasons.
Adap P gain 1	Proportional gain of the range, from zero to **Adap speed 1**. Defined as a % of **Speed P base**.
Adap I gain 1	Integral gain for the range, from zero to **Adap speed 1**. Defined as a % of **Speed I base**.
Adap P gain 2	Proportional gain of the range, from **Adap speed 1** to **Adap speed 2**. Defined as a % of **Speed P base**.
Adap I gain 2	Integral gain of the range, from **Adap speed 1** to **Adap speed 2**. Defined as a % of **Speed I base**.
Adap P gain 3	Proportional gain of the range above **Adap speed 2**. Defined as a % of **Speed P base**.
Adap I gain 3	Integral gain of the range above **Adap speed 2**. Defined as a % of **Speed I base**.

To enable the adaptive speed regulator function, it must be enabled using the **Enable spd adap** parameter.
In the majority of cases, the adaptive speed regulator function is linked to the speed of the motor.
However, it can be varied by another variable, defined by the **Adap reference** parameter. This must be selected with the **Select adap type** parameter.

The **Adap speed 1** and **Adap speed 2** parameters are used to define the three ranges with different gains.
The **Adap joint 1** and **Adap joint 2** parameters ensure a smooth transition between the different sets of parameters. The transition ranges must be defined in such a way that **Adap joint 1** and **Adap joint 2** do not overlap.
When the adaptive speed regulator function is enabled, (**Enable spd adap** = Enabled) the **Speed P** and **Speed I** parameters have no effect. Nonetheless, they retain their value and are restored whenever the adaptive speed regulator function is disabled.

Note! When the motor is not enabled, the gains of the speed regulator are determined by speed zero logic. See Chapter 5.7.2

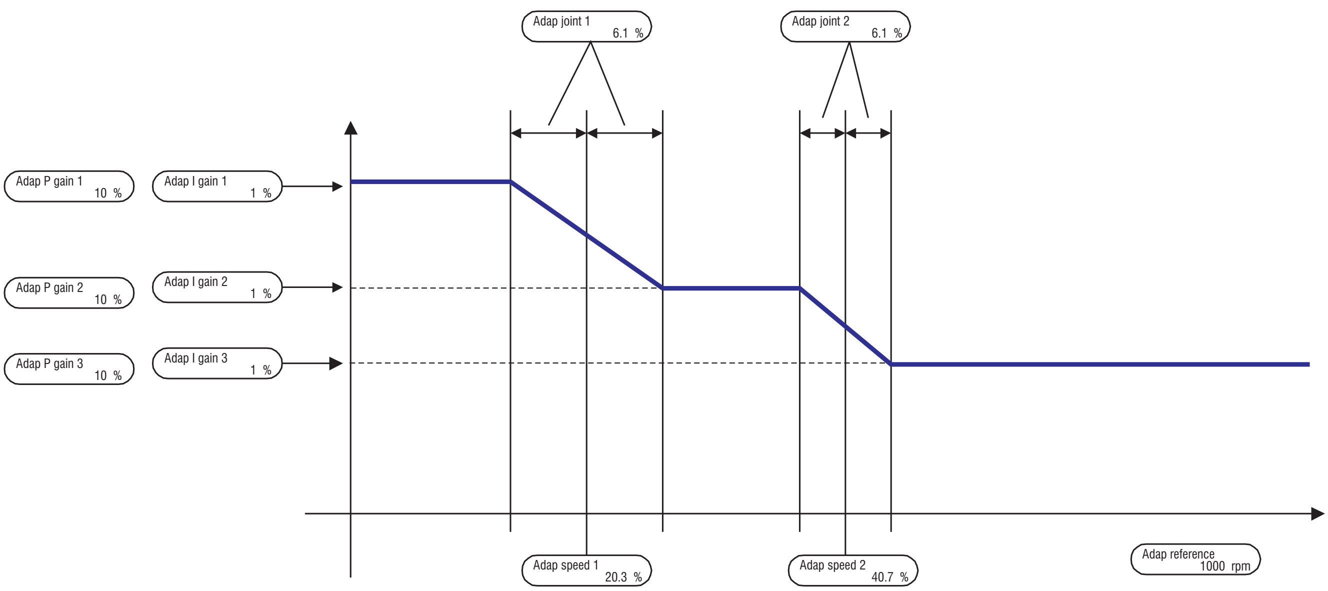


Figure 5.13.2.1: Adaptive speed regulator function.

5.13 Add speed function

ADD SPEED FUNCTION

5.13.3 Speed control

This function is used to handle and signal two cases:
1) When a specific adjustable speed is not exceeded.
2) When the speed corresponds to the set reference value.

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
ADD SPEED FUNCT \ Speed control										
Spd threshold +	101	U16	1	32767	1000		Yes	R/W	-	-
Spd threshold -	102	U16	1	32767	1000		Yes	R/W	-	-
Threshold delay [ms]	103	U16	0	65535	100		Yes	R/W	-	-
Spd threshold Speed not exceeded Speed exceeded	393	U16	0	1		Dig. Output 3 (D)	-	R 1 0	QD H L	R 1 0
Set error	104	U16	1	32767	100		Yes	R/W	-	-
Set delay [ms]	105	U16	1	65535	100		Yes	R/W	-	-
Set speed Speed = ref. val. Speed not ref. val.	394	U16	0	1		(D)	-	R 1 0	QD H L	R 1 0

(D) = This parameter can be assigned to a programmable digital output.

Case 1

Spd threshold + — Maximum speed threshold for clockwise rotation of the drive, in the unit defined by the factor function.

Spd threshold - — Maximum speed threshold for anti-clockwise rotation of the drive, in the unit defined by the factor function.

Threshold delay — Sets a delay in milliseconds for enabling the **Spd threshold** variable when the speed falls below the set threshold.

Spd threshold — Indication that the threshold has been exceeded via a programmable digit output.

Status 1 Speed not exceeded
Status 0 Speed exceeded

Case 2

Set error — Defines a tolerance range around the speed reference in the unit defined by the factor function.

Set delay — Sets a delay in milliseconds for enabling of the Set speed variable when the speed is in the tolerance ranged set by **Set error**.

Set speed — Indication via a programmable digital output

Status 1 When the speed corresponds to the reference value
Status 0 When the speed does not correspond to the reference value

5.13 Add speed function

ADD SPEED FUNCTION

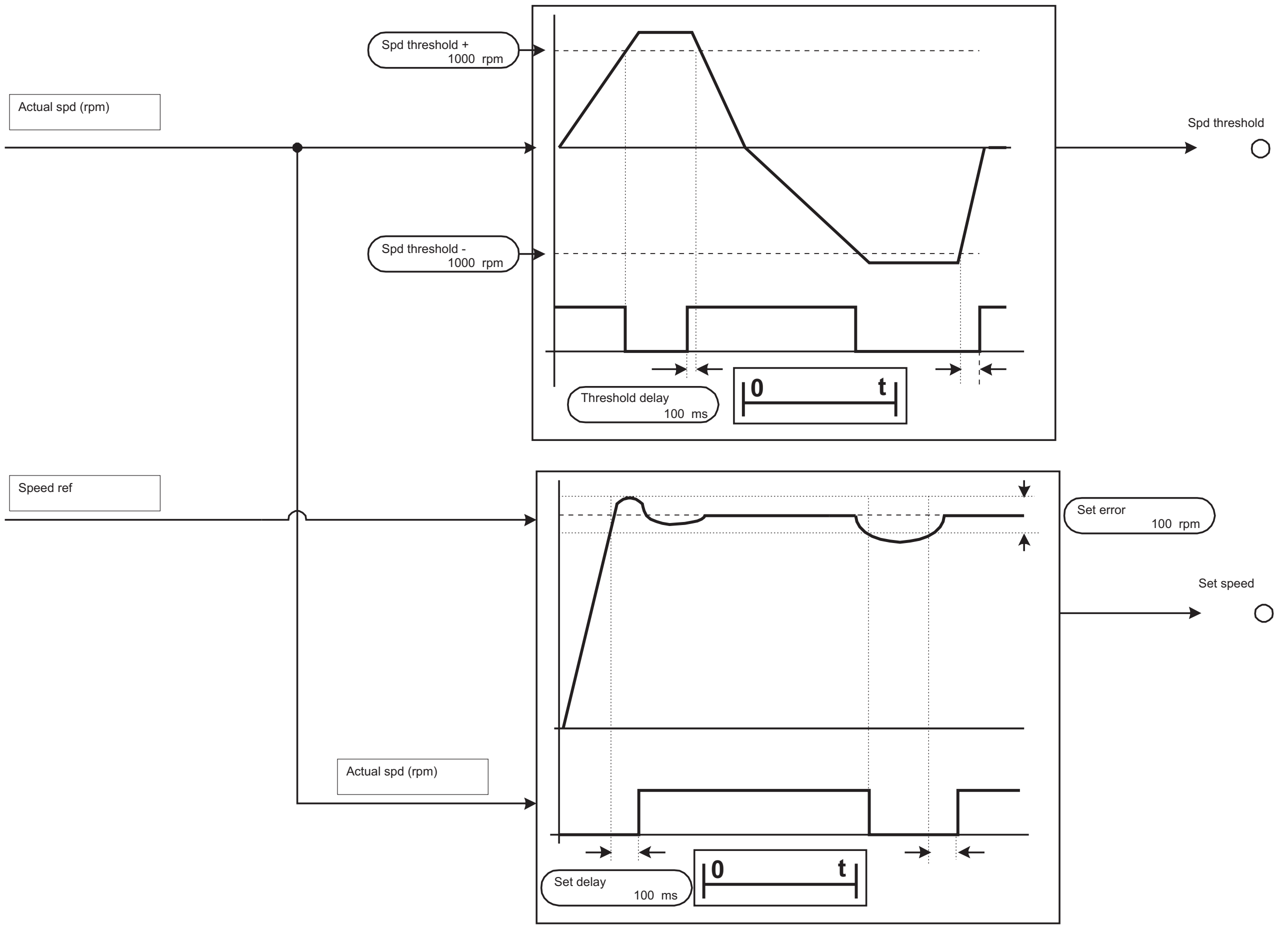


Figure 5.13.3.1: Indication of "Speed not exceeded" (above) and "Speed corresponds to the reference value" (below).

Note: The use of a digital output assigned to the **Spd threshold** variable permits detection of motor overspeed. However, this information is not regarded as a failure by the DC drive and does not, under any circumstances, rule out installation of appropriate overspeed detection devices, as required by the EC Machinery Directive.

The message «Speed corresponds to the reference value» refers to the total reference value of the Speed ref speed regulator or Ramp Ref ramp when this is selected.

When reference values are below ± 1%, the signal is always at Status 0!

ADD SPEED FUNCTION

5.13.4 Speed zero

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
ADD SPEED FUNCT \ Speed zero										
Speed zero level	107	U16	1	32767	10		Yes	R/W	-	-
Speed zero delay [ms]	108	U16	0	65535	100		Yes	R/W	-	-
Speed zero thr	395	U16	0	1		(D)	-	R	QD	R
Drive rotating								1	H	1
Drive not rotating								0	L	0

(D) = This parameter can be assigned to a programmable digital output.

Speed zero level Speed zero detection threshold. The value refers to both rotation directions for DCVN104 DC drives. Defined by the unit specified by the factor function.

Speed zero delay Sets a delay in milliseconds, when speed zero is reached.

Speed zero thr Indication of non-zero speed via a programmable digital output

Status 1 Motor running

Status 0 Motor off

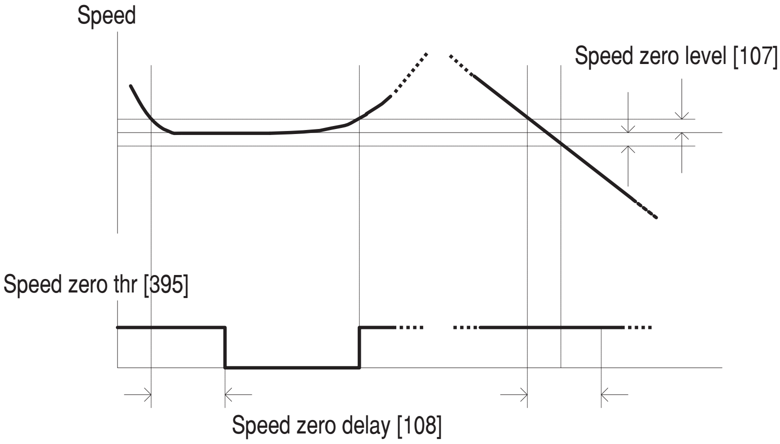


Figure 5.13.4.1: Speed zero.

Note: The LED «n = 0» is lit up on the display when the motor is not running.

The use of a digital output assigned to the **Spd zero thr** variable permits detection of speed zero of the motor. However, this information is not sufficient to guarantee individual safety in the event of sudden motor movement. It is the user's responsibility to protect against this risk by installing devices appropriate for the required level of safety.

FUNCTIONS Motorised Motor potentiometer, jog, multi-speed, multi-ramp, slip, overload control, stop modes, I armature based on the speed

5.14.1 Motor potentiometer

The motor potentiometer function permits motor speed adjustment at the touch of a key. The speed is increased or decreased according to the set ramp time.

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
FUNCTIONS \ Motor pot										
Enable motor pot Enabled Disabled	246	I16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-
Motor pot oper	247						Yes	-	-	-
Motor pot sign Positive Negative	248	I16	0	1	Positive (1)	(G)	Yes	R/W 1 0	ID	-
Motor pot reset	249	U16				(E)	Yes	Z/C(1)	ID (H)	-
Motor pot up Acceleration No acceleration	396	U16	0	1		(E)		R/W 1 0	ID H L	R/W 1 0
Motor pot down Deceleration No deceleration	397	U16	0	1		(E)		R/W 1 0	ID H L	R/W 1 0

(G) = This parameter can only be accessed through a programmable digital input.

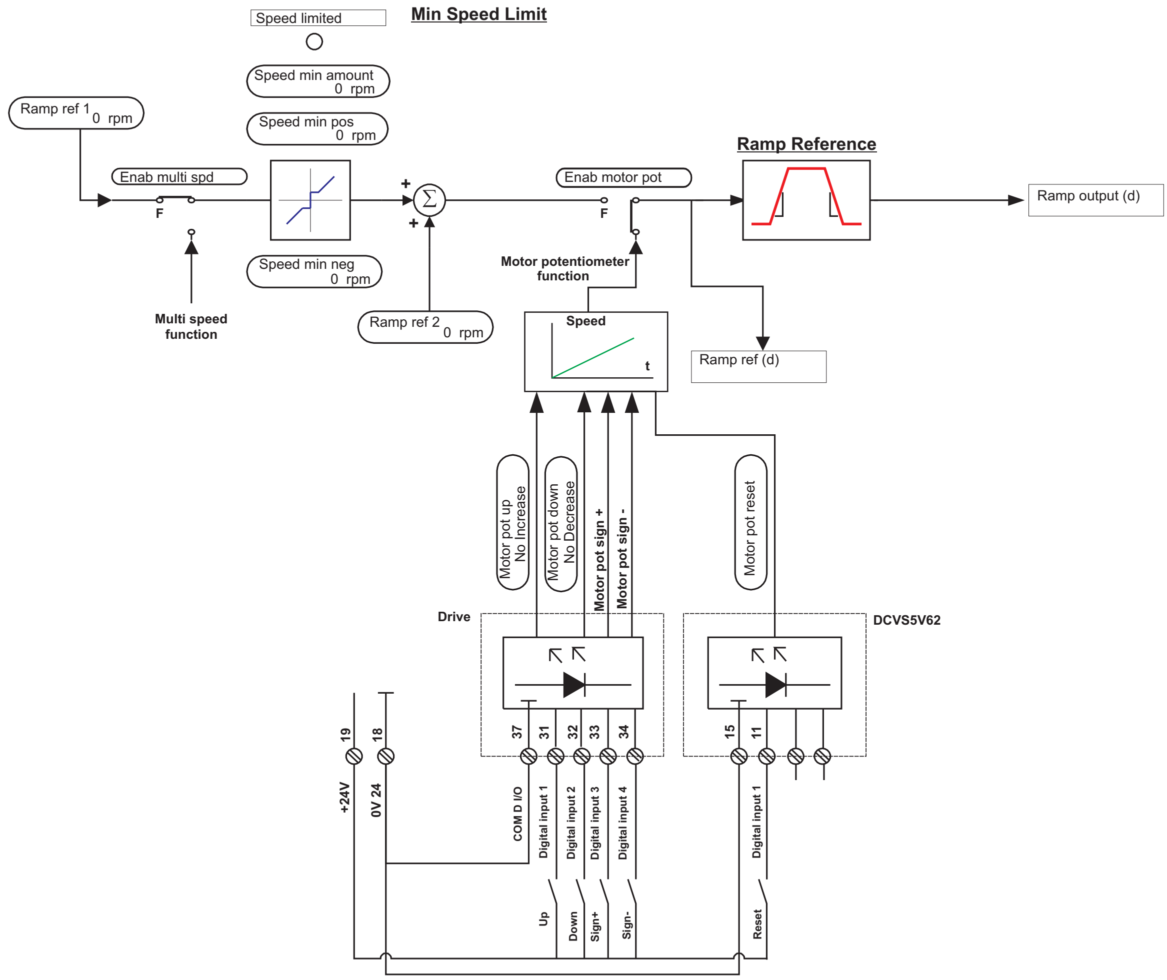


Figure 5.14.1.1: Example of external activation of motor potentiometer function.

5.14 Functions

FUNCTIONS

If a single rotation direction is sufficient, the + sign and - sign signals are not necessary.

Enable motor pot — Enabled: Enabling of the motor potentiometer function. The ramp receives its analog reference value from the motor potentiometer function.
Disabled: The motor potentiometer function is disabled.

Motor pot oper — The “+” and “-” keys on the display keyboard can be used to accelerate or decelerate the motor.
+ **Accelerate** - **Decelerate**

Motor pot sign — This parameter can only be accessed using the keyboard, the serial interface or the CANopen board. When the DC drive is operated from the terminal block, the parameters **Motor pot sign +** and **Motor pot sign -** must be used. For DCVN94 DC drives, the Positive function must be selected.
Positive: Clockwise rotation selected
Negative: Anti-clockwise rotation selected

Motor pot sign + — Only for DCVN104. Selection of clockwise rotation when the operating from the terminal block. The **Motor pot sign +** parameter is linked to the **Motor pot sign -** parameter by a XOR function. This means that the command (+24V) must only be given to one of the two terminals.
Status 1: Clockwise rotation selected
Status 0: Clockwise rotation not selected

Motor pot sign - — Only for DCVN104. Selection of anti-clockwise rotation when operating from the terminal block. The **Motor pot sign -** parameter is linked to the **Motor pot sign +** parameter by a XOR function. This means that the command (+24V) must only be given to one of the two terminals.
Status 1: Anti-clockwise rotation selected.
Status 0: Anti-clockwise rotation not selected.

Motor pot reset — When the reset command of the motor potentiometer is activated and the DC drive is switched off, it restarts at speed zero.
This command is only possible when the DC drive is switched off.

Motor pot up — The motor is accelerated according to the preselected ramp. This command is issued either from the terminal block, the serial interface, or the CANopen board.

Motor pot down — The motor is decelerated according to the preselected ramp. This command is issued either from the terminal block, the serial interface, or the CANopen board.

When the motor potentiometer function is enabled (**Enable motor pot**), the current speed analog reference value is displayed in the **Motor pot** submenu.
The speed can be adjusted from 0 to 100% using the **Motor pot up** command, and from 100 to 0% using the **Motor pot down** command. If the command is issued when the DC drive has already stopped, it will not restart in the opposite direction.
If the **Motor pot up** and **Motor pot down** commands are given at the same time, the speed analog reference value will not change.
The last speed reference is memorised when the DC drive is blocked, or if there is a failure. When restarted, it accelerates to this speed reference according to the ramp set.
If the **Motor pot reset** command is given when the DC drive is switched off, the speed analog reference value is erased and the DC drive restarts at speed zero.
If the **Motor pot sign** command is changed during operation, the motor will slow down and then reverse its direction of rotation, according to the specified ramp times.

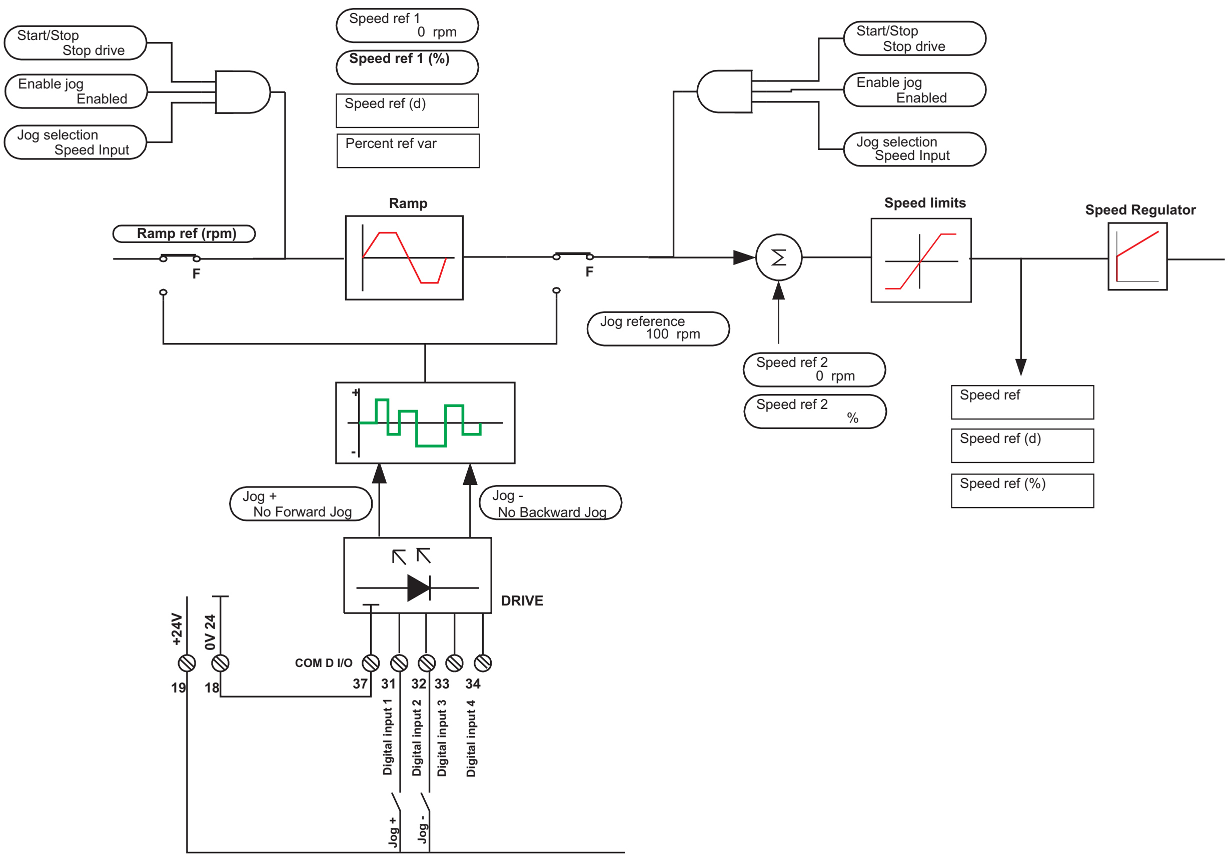
FUNCTIONS

To use the motor potentiometer function, the ramp must be enabled and the **Start** command will be necessary for starting.

5.14.2 Jog function

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
FUNCTIONS \ Jog function										
Enable jog Enabled Disabled	244	I16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-
Jog operation	265	-	-	-	-		Yes	-	-	-
Jog selection Ramp input Speed input	375	U16	0	1	0		Yes	R/Z 1 0	-	-
Jog reference	266	I16	0	32767	0	(C)	Yes	R/W	IA	-
Jog + Forwards jog No jog forwards	398	U16	0	1		(E)		R/W 1 0	ID H L	R/W 1 0
Jog - Backwards jog No backwards jog	399	U16	0	1		(E)		R/W 1 0	ID H L	R/W 1 0

(C) = This parameter may be assigned to a programmable analogue input.
(E) = This parameter may be assigned to a programmable digital input.



FUNCTIONS

Figure 5.14.2.1: Example of external Jog without ramp activation.

Enable jog	Enabled	Enabling of Jog function (this selection is only possible if the DC drive is blocked).
	Disabled	The Jog function is disabled

Jog operation The "+" key on the keyboard is used to give commands for jogging the motor in a clockwise rotation direction. On DCVN104 DC drives, the anti-clockwise direction command is given by pressing the "-" key.

- \+ Jog, clockwise rotation
- \- Jog, anti-clockwise rotation

Jog reference Analog reference value for Jog function. Defined by the unit specified by the factor function.

Jog selection This parameter determines whether the Jog function reference goes through the ramp or whether it is sent directly to the speed regulator.

Speed input	The jog reference is not ramped.
Ramp input	The jog reference is sent through the set ramp.

Jog +	Status 1	Clockwise jog when the Jog function is enabled and no Start command is present.
	Status 0	Disabled
Jog -	Status 1	Anti-clockwise jog for the DCVN104 when the jog function is enabled and no Start command is present.
	Status 0	Disabled

Note: The following signals are necessary for the Jog function, in addition to the **Jog +** and **Jog -** commands:

- **Enable drive**
- **Fast Stop**
- **External fault**

The jog speed corresponds to the value defined by the **Jog reference** parameter. In this case, the ramp is not used.
The jog analog reference value can only be enabled by the **Jog +** or **Jog -** command, if there is no **Start** command present and if the output voltage of the DC drive is zero.
If the **Start** command is given as well as the **Jog +-** and **Jog -** commands, the jog mode will be aborted and the DC drive will respond to the **Start** command.
When using the keyboard, the "+" and "-" keys can be used in the **Jog function** menu (for DCVN104 only). For this, select Jog operation in the menu.

Warning! If the correction value **Speed ref 2** is not zero, it is also enabled when operating in Jog mode.

Note!

FUNCTIONS

If the **Stop control** function is enabled, the **Jog stop control** parameter must be set to ON (1) to enable Jog function.

5.14.3 Multi speed function

The multi speed function allows the programming of up to seven internally-stored speed analog reference values, using a combination of three digital input statuses.

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
FUNCTIONS \ Multi speed fct										
Enab multi spd Enabled Disabled	153	I16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-
Multi speed 1	154	I16	-32768	+32767	0		Yes	R/W	-	-
Multi speed 2	155	I16	-32768	+32767	0		Yes	R/W	-	-
Multi speed 3	156	I16	-32768	+32767	0		Yes	R/W	-	-
Multi speed 4	157	I16	-32768	+32767	0		Yes	R/W	-	-
Multi speed 5	158	I16	-32768	+32767	0		Yes	R/W	-	-
Multi speed 6	159	I16	-32768	+32767	0		Yes	R/W	-	-
Multi speed 7	160	I16	-32768	+32767	0		Yes	R/W	-	-
Speed sel 0 Value 2^0 selected Value 2^0 not selected	400	U16	0	1		Dig. input 5 (E)	-	R/W 1 0	ID H L	R/W 1 0
Speed sel 1 Value 2^1 selected Value 2^1 not selected	401	U16	0	1		Dig. input 6 (E)	-	R/W 1 0	ID H L	R/W 1 0
Speed sel 2 Value 2^2 selected Value 2^2 not selected	402	U16	0	1		Dig. input 7 (E)	-	R/W 1 0	ID H L	R/W 1 0
Multispeed sel	208	U16	0	7	0		Yes	R/W	ID	R/W

(E) = This parameter may be assigned to a programmable digital input.

5.14 Functions

FUNCTIONS

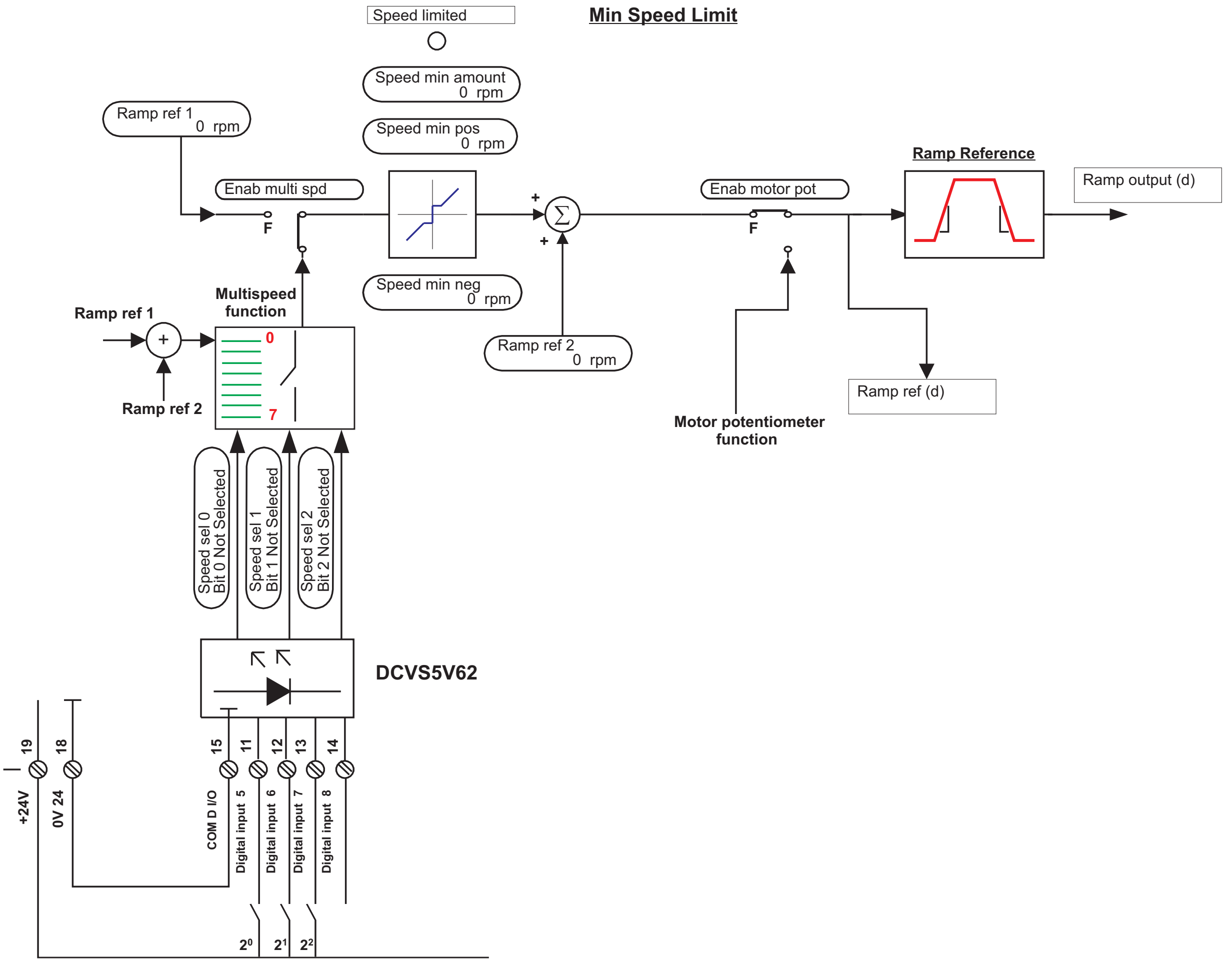


Figure 5.14.3.1: Multi speed.

Enab multi spd	Enabled	Multi speed function enabled
	Disabled	Multi speed function disabled

Multi speed 1 Analog reference value 1. Defined in the unit specified by the factor function.

Multi speed 2 Analog reference value 2. Defined in the unit specified by the factor function.

Multi speed 3 Analog reference value 3. Defined in the unit specified by the factor function.

Multi speed 4 Analog reference value 4. Defined in the unit specified by the factor function.

Multi speed 5 Analog reference value 5. Defined in the unit specified by the factor function.

Multi speed 6 Analog reference value 6. Defined in the units specified by the factor function.

Multi speed 7 Analog reference value 7. Defined in the unit specified by the factor function.

FUNCTIONS

Speed sel 0 Selection of analog reference value with bit weight 2^0 (=1). This parameter can only be used with **Speed sel 1** and **Speed sel 2**.

Status 1 2^0 (=1)

Status 0 0

Speed sel 1 Selection of analog reference value with bit weight 2^1 (=2). This parameter can only be used with **Speed sel 0** and **Speed sel 2**.

Status 1 2^1 (=2)

Status 0 0

Speed sel 2 Selection of analog reference value with bit weight 2^2 (=4). This parameter can only be used with **Speed sel 0** and **Speed sel 1**.

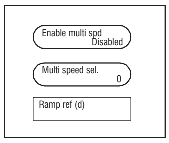
Status 1 2^2 (=4)

Status 0 0

Multi speed sel This is the word representing the three parameters **Speed sel 1** (bit0), **Speed sel 2** (bit1) and **Speed sel 3** (bit2). It is used to change the speed reference selection by changing a single parameter instead of three. This allows the instantaneous selection of different speeds either through the serial link or the CANopen board.

The table and graph below illustrate the association between selection status and the corresponding analog reference value.

Speed sel 0 Bit 0 Not Selected	Speed sel 1 Bit 1 Not Selected	Speed sel 2 Bit 2 Not Selected	REFERENCE
0	0	0	Ramp ref 1 0 rpm + Ramp ref 2 0 rpm
1	0	0	Multi speed 1 0 rpm
0	1	0	Multi speed 2 0 rpm
1	1	0	Multi speed 3 0 rpm
0	0	1	Multi speed 4 0 rpm
1	0	1	Multi speed 5 0 rpm
0	1	1	Multi speed 6 0 rpm
1	1	1	Multi speed 7 0 rpm



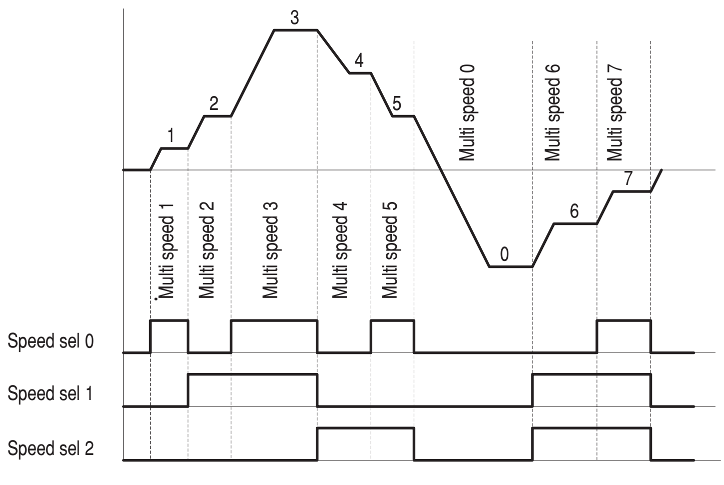


Figure 5.14.3.2: Preselected Multi speed function

5.14 Functions

FUNCTIONS

The multi speed function must be enabled by the **Enab multi spd** parameter before it can be used.
The analog reference values are selected using the keyboard, the serial interface or with the set-up and programming software.
The analog reference values are signed so that they can be defined for a particular direction of motor rotation. For DCVN94 DC drives, the polarity of the reference must be positive.
When the multi speed function is enabled, Multi speed 0 is defined by the addition of the reference values **Ramp ref 1** and **Ramp ref 2**.

FUNCTIONS

5.14.4 Multi ramp function

The Multi ramp function allows the programming of up to four different ramps using a combination of two digital inputs. The acceleration and deceleration times can be defined separately.

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
FUNCTIONS \ Multi ramp fct										
Enab multi rmp	243	I16	0	1	Disabled		Yes	R/Z	-	-
Enabled								1		
Disabled					(0)			0		
Ramp selector	202	U16	0	3	0		Yes	R/W	ID	R/W
FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0										
Acc delta speed0	659	U32	0	2^{32}-1	100		Yes	R/W	-	-
Acc delta time 0 [s]	660	U16	0	65535	1		Yes	R/W	-	-
S acc t const 0 [ms]	665	Float	100	3000	300		Yes	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0										
Dec delta speed0	661	U32	0	2^{32}-1	100		Yes	R/W	-	-
Dec delta time 0 [s]	662	U16	0	65535	1		Yes	R/W	-	-
S dec t const 0 [ms]	666	Float	100	3000	300		Yes	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1										
Acc delta speed1	23	U32	0	2^{32}-1	100		Yes	R/W	-	-
Acc delta time 1 [s]	24	U16	0	65535	1		Yes	R/W	-	-
S acc t const 1 [ms]	667	Float	100	3000	300		Yes	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1										
Dec delta speed1	31	U32	0	2^{32}-1	100		Yes	R/W	-	-
Dec delta time 1 [s]	32	U16	0	65535	1		Yes	R/W	-	-
S dec t const 1 [ms]	668	Float	100	3000	300		Yes	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2										
Acc delta speed2	25	U32	0	2^{32}-1	100		Yes	R/W	-	-
Acc delta time 2 [s]	26	U16	0	65535	1		Yes	R/W	-	-
S acc t const 2 [ms]	669	Float	100	3000	300		Yes	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2										
Dec delta speed2	33	U32	0	2^{32}-1	100		Yes	R/W	-	-
Dec delta time 2 [s]	34	U16	0	65535	1		Yes	R/W	-	-
S dec t const 2 [ms]	670	Float	100	3000	300		Yes	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3										
Acc delta speed3	27	U32	0	2^{32}-1	100		Yes	R/W	-	-
Acc delta time 3 [s]	28	U16	0	65535	1		Yes	R/W	-	-
S acc t const 3 [ms]	671	Float	100	3000	300		Yes	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3										
Dec delta speed3	35	U32	0	232-1	100		Yes	R/W	-	-
Dec delta time 3 [s]	36	U16	0	65535	1		Yes	R/W	-	-
S dec t const 3 [ms]	672	Float	100	3000	300		Yes	R/W	-	-
Ramp sel 0	403	U16	0	1		(E)	-	R/W	ID	R/W
Value 2^0 selected								1	H	1
Value 2^0 not selected								0	L	0
Ramp sel 1	404	U16	0	1		(E)	-	R/W	ID	R/W
Value 2^1 selected								1	H	1
Value 2^1 not selected								0	L	0

(E) This parameter can be assigned to a programmable digital input.

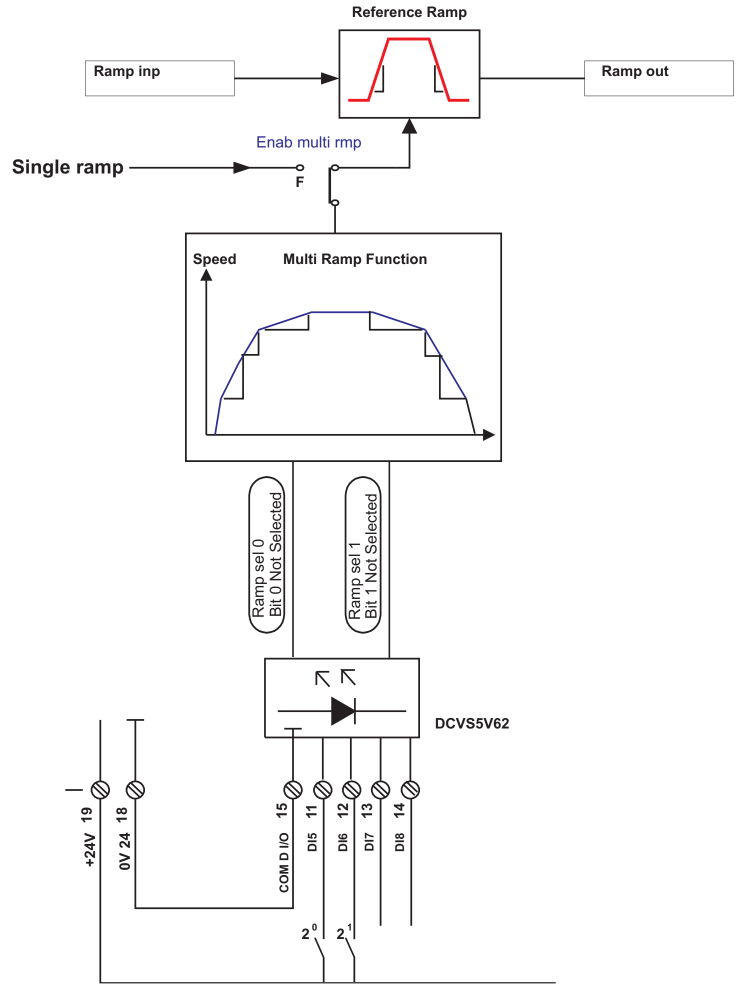


Figure 5.14.4.1: Selection of different ramps on the terminal block.

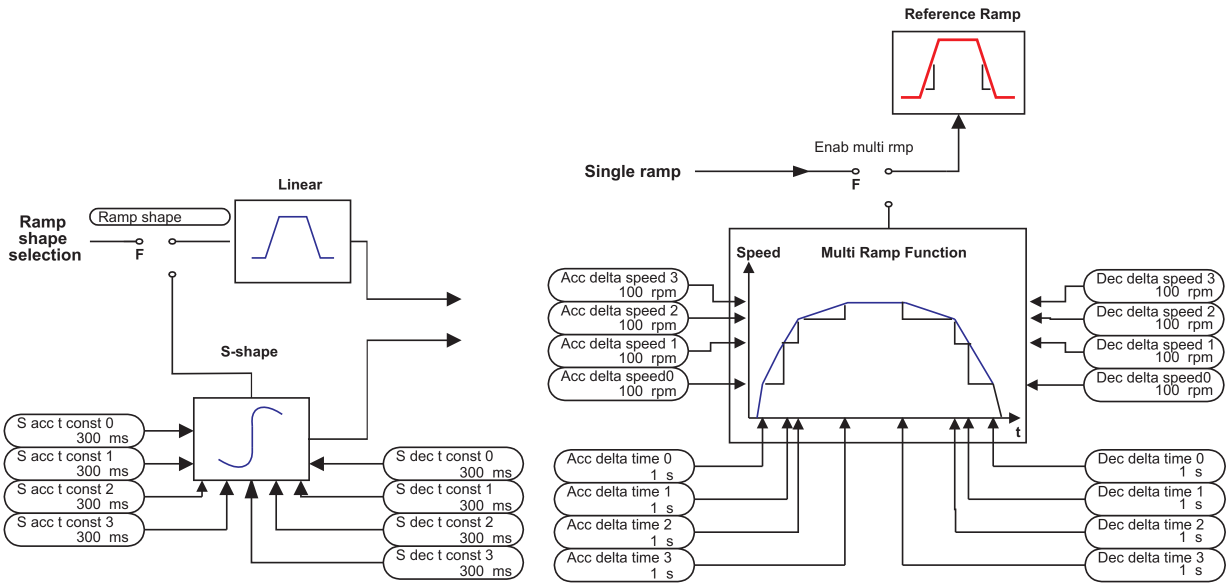


Figure 5.14.4.2: Choice of different ramps using the keyboard or serial interface.

5.14 Functions

FUNCTIONS

Enab multi rmp	Enabled	Multi ramp function enabled.
	Disabled	Multi ramp function disabled.

Ramp selector — This is the word representing the two parameters **Ramp sel 0** (bit0), **Ramp sel 1** (bit1). It is used to change the ramp selection by changing a single parameter instead of two. This allows the instantaneous selection of different ramps either through the serial interface or through the CANopen board.

Ramp sel 0 — Selection of ramp with bit weight 2^0 (=1). This parameter can only be used together with **Ramp sel 1**.

Status 1	2^0 (=1)
Status 0	0

Ramp sel 1 — Selection of ramp with bit weight 2^1 (=2). This parameter can only be used together with **Ramp sel 0.**

Status 1	2^1 (=2)
Status 0	0

Acc delta speed 0 — Increase in acceleration speed of ramp 0. Defined by the unit specified by the factor function.

Acc delta time 0 — Increase in acceleration time of ramp 0. Defined in seconds.

S acc t const 0 — Defines the acceleration curve for S-shaped ramp 0. Defined in ms.

Dec delta speed 0 — Decrease in deceleration speed of ramp 0. Defined by the unit specified by the factor function.

Dec delta time 0 — Increase in deceleration time of ramp 0. Defined in seconds.

S dec t const 0 — Defines the deceleration curve for S-shaped ramp 0. Defined in ms.

Acc delta speed1 — Increase in acceleration speed of ramp 1. Defined by the unit specified by the factor function.

Acc delta time 1 — Increase in acceleration time of ramp 1. Defined in seconds.

S acc t const 1 — Defines the acceleration curve for S-shaped ramp 1. Defined in ms.

Dec delta speed1 — Decrease in deceleration speed of ramp 1. Defined by the unit specified by the factor function.

Dec delta time 1 — Increase in deceleration time of ramp 1. Defined in seconds.

S dec t const 1 — Defines the deceleration curve for S-shaped ramp 1. Defined in ms.

Acc delta speed 2 — Increase in acceleration speed of ramp 2. Defined by the unit specified by the factor function.

Acc delta time 2 — Increase in acceleration time of ramp 2. Defined in seconds.

S acc t const 2 — Defines the acceleration curve of S-shaped ramp 2. Defined in ms.

Dec delta speed 2 — Decrease in deceleration speed of ramp 2. Defined by the unit specified by the factor function.

Dec delta time 2 — Increase in deceleration time of ramp 2. Defined in seconds.

S dec t const 2 — Defines the deceleration curve of S-shaped ramp 2. Defined in ms.

FUNCTIONS

Acc delta speed 3 Increase in acceleration speed of ramp 3. Defined by the unit specified by the factor function.

Acc delta time 3 Increase in acceleration time of ramp 3. Defined in seconds.

S acc t const 3 Defines the acceleration curve of S-shaped ramp 3. Defined in ms.

Dec delta speed 3 Decrease in deceleration speed of ramp 3. Defined by the unit specified by the factor function.

Dec delta time 3 Increase in deceleration time of ramp 3. Defined in seconds.

S dec t const 3 Defines the deceleration curve for S-shaped ramp 3. Defined in ms.

The table below illustrates the correspondence between selection status and the corresponding ramp.

	Ramp sel 0	Ramp sel 1
Ramp 0	Status 0	Status 0
Ramp 1	Status 1	Status 0
Ramp 2	Status 0	Status 1
Ramp 3	Status 1	Status 1

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The Multi ramp function must be enabled by the **Enab multi rmp** parameter before use.
The ramp values are selected using the keyboard, the serial interface or with the set-up and commissioning software.

FUNCTIONS

5.14.5 Speed Draw

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
FUNCTIONS \ Speed draw										
Speed ratio	1017	I16	0	+32767	+10000	(C)	Yes	R/W	IA	R/W
Speed draw out (d)	1018	I16	-32768	+32767	-	(A)	Yes	R	QA	R/W
Speed draw out (%)	1019	Float	-200.0	+200.0	-		Yes	R	-	-

(A) This parameter can be assigned to a programmable analog output.
(C) This parameter can be assigned to a programmable analog input.

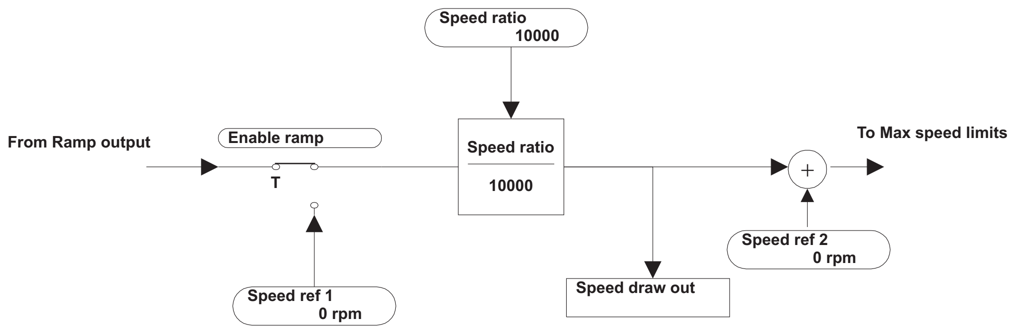


Figure 5.14.5.1: Speed draw function

This function allows application of a configurable speed ratio (**Speed ratio**) to the main reference **Speed ref 1**. The **Speed ratio** value can be set from 0 to 32767 if defined in digital form. It can be set from 0 to 20000 (0 to +10V) if assigned by an analog input. This function is useful in "sectional" systems when a draw value is required between the different motors used (see example in Figure 5.14.5.2). The resulting speed reference value can be read through the **Spd draw out** parameter through a programmable analog output.

Speed ratio This parameter defines the value of the speed ratio. This setting can be carried out through the serial interface, the CANopen board, or through an analog input.

Spd draw out (d) Output speed value of the function specified by the factor function.

Spd draw out (%) Output speed value of the function as a % of **Speed base value**.

FUNCTIONS

E.g.: Cross-section

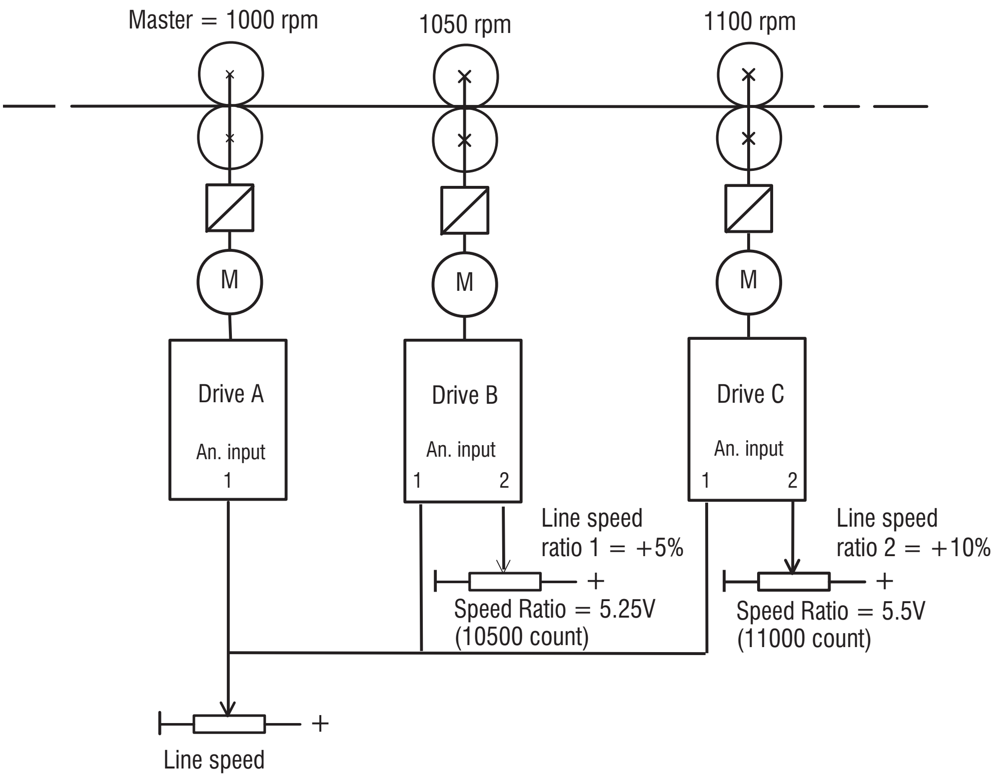


Figure 5.14.5.2: Cross-section.

DC drive A (master)
Set analog input 1 = **Ramp ref 1**

DC drive B
Slip 1 = **Line Spd Ref + 5%**
Set analog input 1 = **Ramp ref 1**
Set analog input 2 = **Speed ratio**
Set Speed ratio parameter = **10500**

DC drive C
Slip 2 = **Line Spd Ref + 10%**
Set analog input 1 = **Ramp ref 1**
Set analog input 2 = **Speed ratio**
Set Speed ratio parameter = **11000**

FUNCTIONS

5.14.6 Overload control

Overload control permits an overload higher than the rated current of the DC drive, for a limited time only. It is used to allow a transient overtorque during acceleration or braking (DCVN104 only), or to provide the peak torques needed with piston loads.
So as not to exceed the heat loss capacity (power Imt) of the DC drive and connected material (circuit-breaker, inductors, switch, ...), the limits in Chapters 2.2.2 and 2.2.3 of this guide must be observed for setting the Overload control function parameters.

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
FUNCTIONS \ Overload contr										
Enable overload	309	I16	0	1	Disabled		Yes	R/Z	-	-
Enabled								1		
Disabled					(0)			0		
Overload mode	318	U16	0	1	Curr limited		Yes	R/W	-	-
Curr limited					(0)			0		
Curr not limited								1		
I2t								2		
Overload current [%]	312	U16	P313	200	100		Yes	R/W	-	-
Base current [%]	313	U16	0	P312 ≤ 100	80		Yes	R/W	-	-
Overload time [s]	310	U16	0	65535	30		Yes	R/W	-	-
Ovrld prealarm	1289	U16	0	1	-		Yes	R	-	-
I2t accumulator	655	Float	0	100.00%	-		Yes	R	-	-
Pause time [s]	311	U16	0	65535	300		Yes	R/W	-	-
Overld available	406	U16	0	1		Dig. Output 4	-	R	QD	R
Overload possible						(D)		1	H	1
Overload not possible								0	L	0
Overload state	407	U16	0	1		(D)	-	R	QD	R
Current > limit value								1	H	1
Current limit value								0	L	0

(D)This parameter can be assigned to a programmable digital output.

Enable overload Enabled — Overload control enabled
Disabled — Overload control disabled

Overload mode Curr limited — The armature current is managed by the Overload control within the set limits for the duration and amplitude of the overload.

Curr not limited — The armature current is not managed by the Overload control.

Overload current Armature current (Ip) authorised during the overload (set by **Overload time**). The maximum value is 155% of **Full load curr**.

Base current Current in set system (Io) authorised during idle periods (set by **Pause time**). The % refers to **Full load curr**.

Overload time Maximum time for which **Overload current** is authorised.

Pause time Minimum idle period between two overload cycles. **Base current** is authorised during this time.

FUNCTIONS

Overld available Information indicating whether a new overload is possible without exceeding the heat capacity of the DC drive.

Status 1	Overload authorised
Status 0	Overload not authorised

Overload state If **Overload mode** has been configured so that the armature current is not handled by Overload Control, the parameter **Overload state** provides information indicating whether or not the current is within the set limits.

Status 1	The induction current exceeds the set limits
Status 0	The induction current does not exceed the set limits

Overload control is enabled for the **Enable overload** parameter.

Warning! When the current exceeds the value set by **Base current**, countdown begins by the time set by **Overload time**. Once completed, the current is again limited to **Base current**, regardless of the amplitude and duration of the overload. Ensure that this is compatible with the application (reduction in available torque).

Warning! New overloads are not authorised before the end of the time set by **Pause time**. If **Overload mode** is enabled on «Curr not limited», the current is not limited, but **Overload state** will indicate whether the current is outside the set range.

Warning! Erroneous values can result in damage to the DC drive.

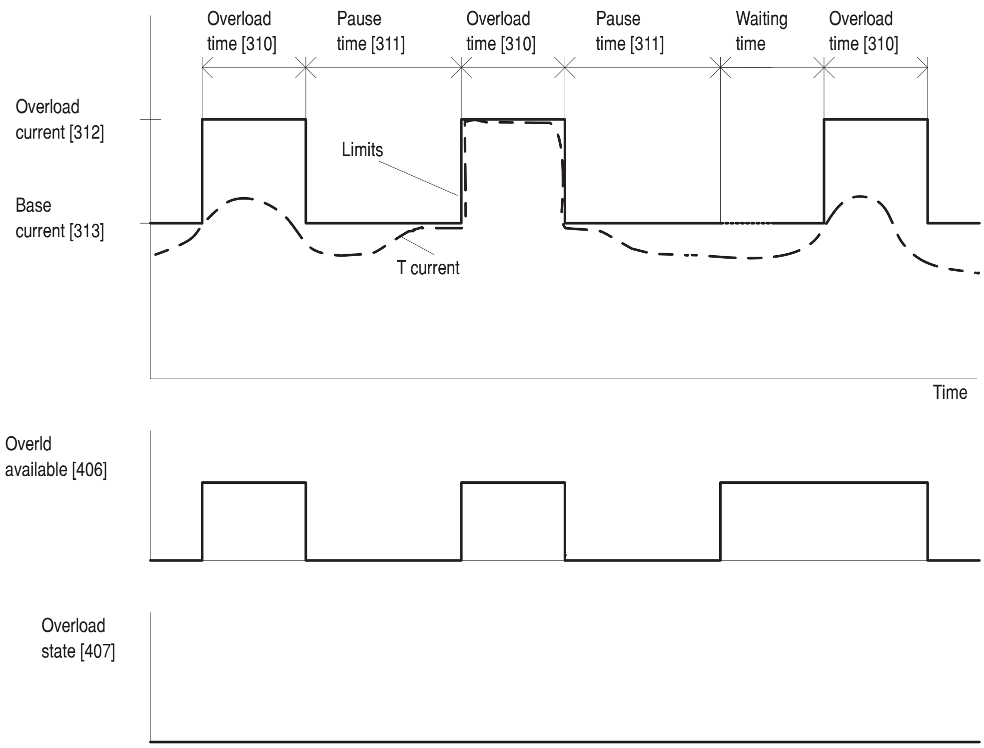


Figure 5.14.6.1: Overload control (Overload mode = Curr limited).

FUNCTIONS

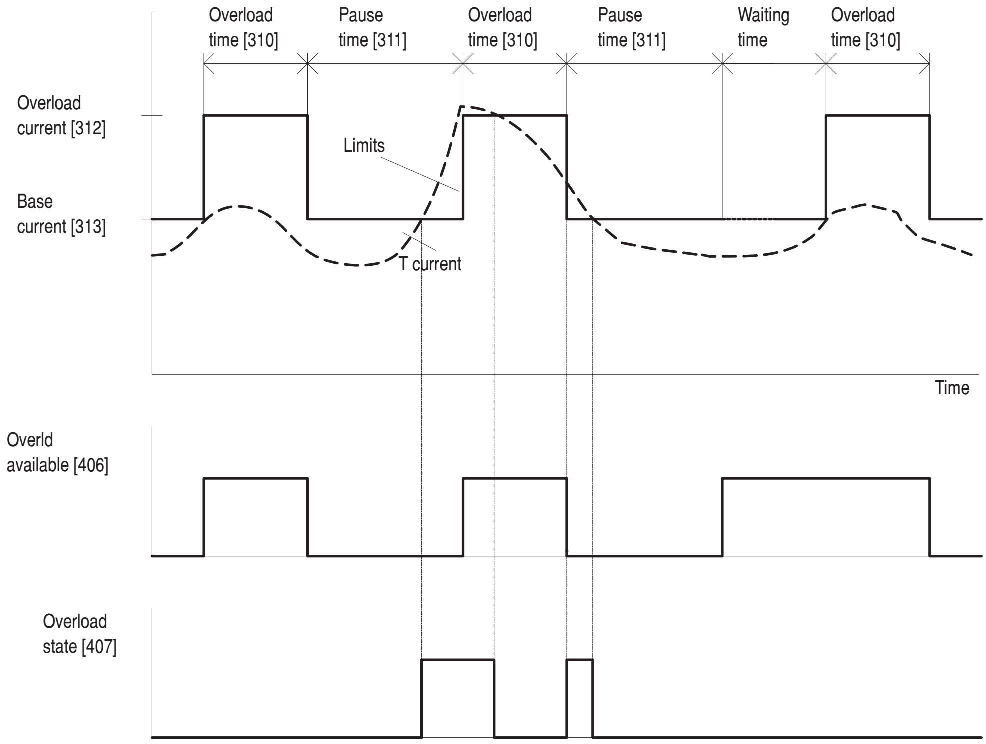


Figure 5.14.6.2: Overload control (Overload mode = Curr not limited).

Note! The % of **Overload current** and **Base current** relate to the **Full load curr** value, not to the rated current of the DC drive.

FUNCTIONS

5.14.7 Stop control

This function allows the DC drive to control the line contactor. Relay 2 (terminals 75 and 76) is assigned to this function by default, but any other digital output would be suitable, so long as an appropriate interface is set up with the line contactor.

When the DC drive receives the Start command, relay 2 closes the line contactor and the DC drive starts up the motor.

When the DC drive is stopped, the motor speed drops. When speed zero is reached, the DC drive is disabled after a delay set by the **Spd 0 trip** parameter. After the delay set by the **Trip cont delay** parameter, relay 2 opens to cut off the line-contactor coil.

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
FUNCTIONS \ Stop control										
Stop mode	626	U16	0	3	Stop & Speed 0	(D)	Yes	R/Z	-	-
OFF						Relay 75/76		0		
Stop & speed 0								1		
Fast stp & spd 0								2		
Fst / stp & spd 0								3		
Spd 0 trip delay [ms]	627	U16	0	40000	0		Yes	R/W	-	-
Trip cont delay [ms]	628	U16	0	40000	0		Yes	R/W	-	-
Jog stop control	630	U16	0	1	OFF		Yes	R/Z	-	-
ON								1		
OFF					(0)			0		

(D)This parameter can be assigned to a programmable digital output.

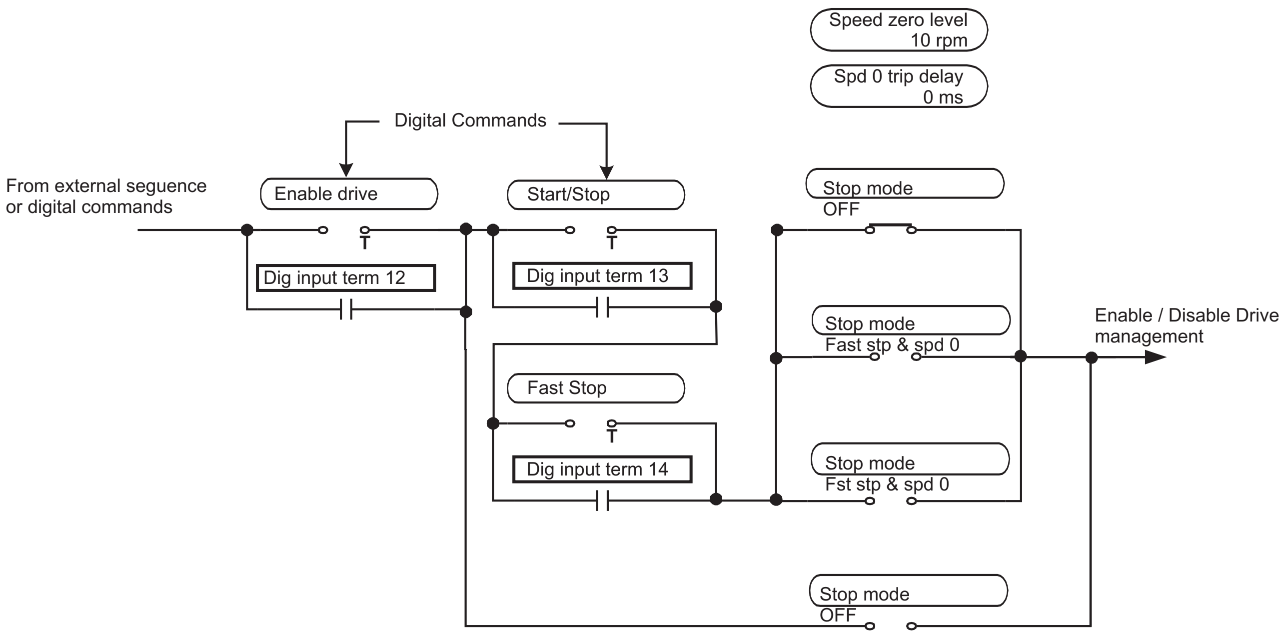


Figure 5.14.7.1: Management.

5.14 Functions

FUNCTIONS

Stop mode	OFF	Line contactor control function is disabled.
	Stop & Speed 0	The line contactor is closed when the “Start” (0->1) command is given, either from the terminal strip or digitally. When the Start command is disabled (1->0) and after speed zero is reached, the DC drive is blocked after a time delay set by **Spd 0 trip delay**. The contactor opens following a time delay set by **Trip cont delay**.
	Fast stp & spd 0	The line contactor is closed on the “Start command” from either the terminal block or serial link. When the «Fast Stop» command is disabled (Status 0 of terminal 14), and after speed zero has been reached, the DC drive is blocked following a time delay set by **Spd 0 trip delay**. The contactor opens following a time delay set by **Trip cont delay**.
	Fst / stp & spd 0	The line contactor is closed when the “Start” (0->1) or Fast Stop (Status 1 of terminal 14) commands are given. When the «Start» (1->0) or «Fast Stop» commands are disabled (Status 0 of terminal 14) and once speed zero has been reached, the DC drive is blocked following a time delay set by **Spd 0 trip delay**. The contactor opens following a time delay set by **Trip cont delay**.

Spd 0 trip delay Delay in ms between the detection of speed zero and locking of the DC drive.

Trip cont delay Delay in ms between locking and the opening of the contacts 75 and 76 (or connected logic output) for the line-contactor command.

Jog stop control	OFF	The use of **Stop mode** to control the line contactor has no effect on Jog function.
	ON	The use of **Stop mode** to control of the line contactor is enabled on the Jog function.

Note! When **Main commands** = Keyboard, the parameter **Enable drive** = Enabled by the keyboard or bus must be selected.

5.14.8 Lifting function

The Lifting function, also called vertical shift, is equipped with a base for DCVN104 DC drives. Its purpose is to extend the possibilities of the DC drive system software by allowing a second possible setup for the motor and/or control logic for vertical shift of a mechanical brake (or by extension, any shift whose load eliminates a torque in the same direction, whatever the rotation of the motor).

5.14.8.1 Brake logic

The aim of the brake control logic is to ensure that the machine exerts a torque in the «ascending» direction, by «Forward» convention, able to retain the load during the transient brake release phase, whichever direction is controlled. It also checks that the DC drive and mechanical brake are working before each movement validation.
During the transient brake release phase, regulation is also maintained at speed zero, after electrical braking, for a fixed period of 1s.

Note! Warning! Do not use the DC drive in armature voltage speed feedback. The lack of precision of this type of adjustment is not compatible with the brake command.

Input/output assignment

In the I/O CONFIG menu

Brake fbk Assignment of a digital input to brake actuator feedback.

Brake command Assignment of a digital output to the brake switch command by setting up a suitable interface or K2 relay (terminals 75-76).

Brake error Assignment, where necessary, of a digital output in the absence of a brake switch response.

Brake Ref Assignment of an analog input to the load weight. If this assignment is configured, it will no longer be possible to change its value on the keyboard.

+10V corresponds to 100% of the rated motor current indicated in the MOTOR DATA menu.

If it is necessary to change the retained current reference to a higher value, this can be done using the «Scale input x» parameter. It should not be changed to a value over the armature limitation current of the DC drive.

Settings

In the FUNCTIONS/BRAKE CONTROL menu

Torque command Enabling of the Brake logic function.

Closing speed Adjustment of the speed at which the brake is reset.

Torque delay Time to apply brake lift current and actuator feedback.

Torque proving Value of retained current, as a % of the rated current. This should not be changed to a value over the armature limitation current of the DC drive.

Min Trq proving Active only with Torque proving (on an analog input).

Minimum current threshold for torque proving as a % of the nominal current. Torque proving below this value is not taken into consideration and this threshold will be applied.

100% = Motor current indicated in the MOTOR DATA menu (scaling AIx =1).

Actuator delay Actuator response time.

FUNCTIONS

Note:

- If using a horizontal motion set-up, set: **Torque proving** to zero.
  The brake logic sequence does not begin until the "Start" order is received from the DC drive.
  If the DC drive is assigned to a directional command by the "ascending" "descending" logic orders, these three inputs should be wired and configured.

- Programming of "Brake error" default

  This default results in the opening of the DC drive safety relay (terminals 35-36) and logic output (or relay) assigned to the brake command, and is memorised.

- It is necessary to set the **Speed zero level** parameter to 2% of the **Speed base value** .
  Set the **Speed zero delay [ms]** timer to 1100ms to allow the DC drive to maintain the limitation current during brake-pad resetting.

FUNCTIONS

Time chart

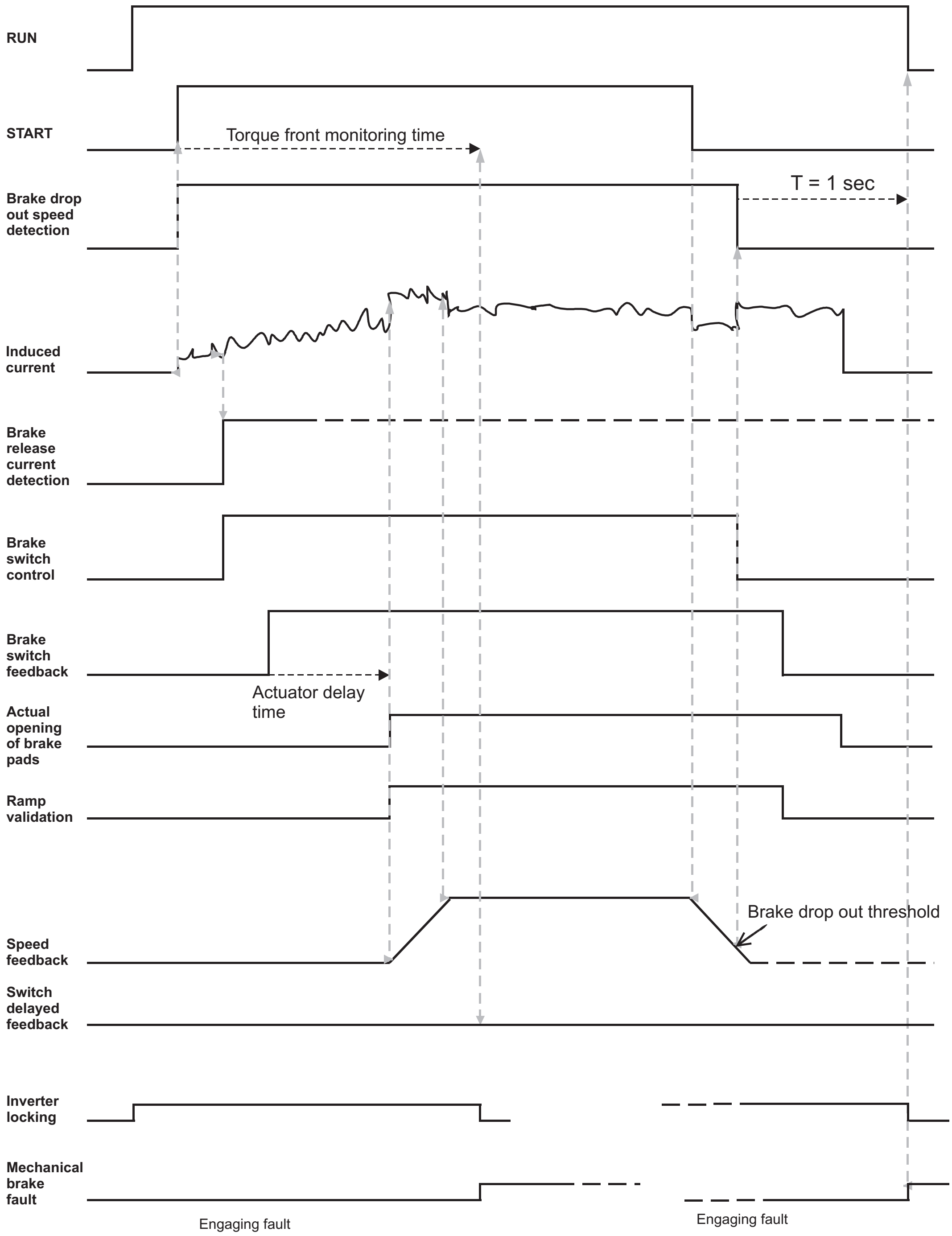


Diagram of control

Functional diagram with minimal use of inputs and outputs.

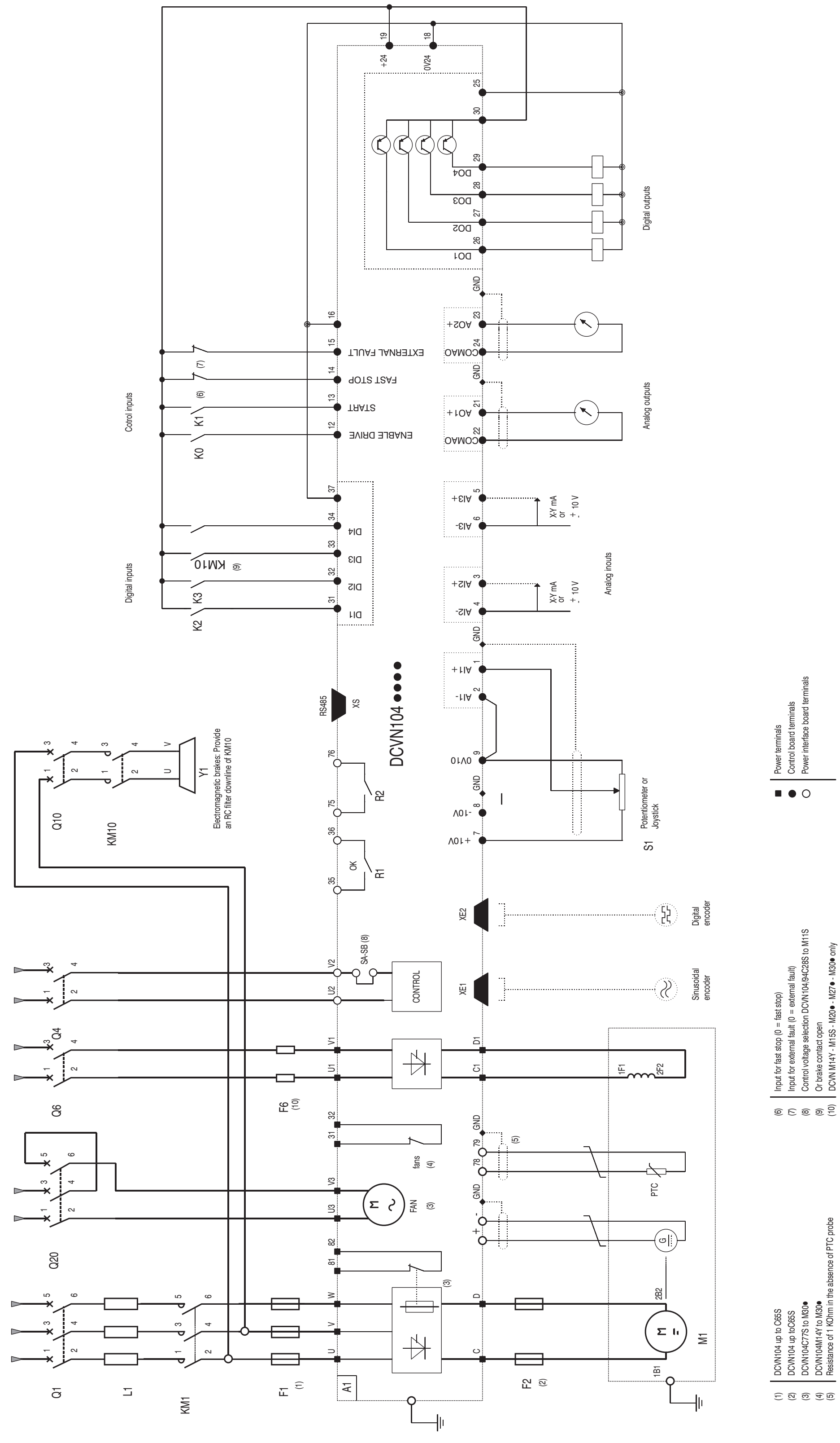
Specific assignments of this diagram:

DI1:	Fwd sign	Ascending, conventionally “Forward”
DI2 :	Rev sign	Descending, conventionally “Reverse”
DI3:	Brake fbk	Brake contactor feedback
Relay 2:	Brake command	KM10 contactor command

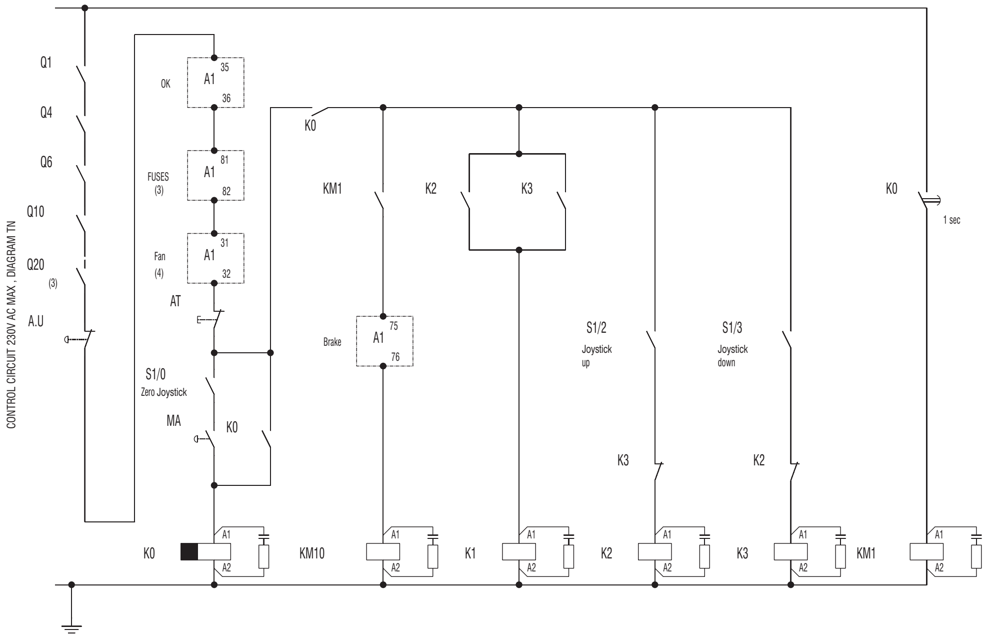
5 - Main functions

5.14 Functions

FUNCTIONS



FUNCTIONS



IEC/EN 60204-1 stop category 0

5.14.8.2 Double setting

Double setting allows the DC drive to be operated using two sets of different parameters.
To select one of the sets of operating parameters (Setup 0 or Setup 1), the DC drive must be inoperative, locked and without failures to analyse the failure in the setup in which it appears.

Input/output assignment

In the I/O CONFIG menu

Setup0/Setup1	Loads Setup 0 (Input status 0) or setup 1 (Status 1).

Settings

In the FUNCTIONS / DOUBLE SETUP menu

Copy setup	Saves the list of parameters in setup 1 or 2
Load setup	Loads the list of parameters in Setup 1 or 2
Actual setup	Indicates the loaded setup (1, 2 or 0 - none).

5.14 Functions

FUNCTIONS

List of parameters

Parameter No.	Description
P45	Speed base value
P21	Acc. delta speed
P22	Acc. delta time
P29	Dec. delta speed
P30	Dec. delta time
P179	Full load curr
P162	Motor max speed
P175	Max out voltage
P456	Flux weak speed
P280	Motor nom flux
P7	T current limit
P715	T curr lim type
P467	Flux current min
P468	Flux current max
P1	Speed min amount
P2	Speed max amount
P414	Speed fbk sel
P562	Tacho scale
P457	Enable fbk contr
P481	Undervolt Thr
P309	Enable overload
P318	Overload mode
P312	Overload current
P313	Base current
P310	Overload time
P311	Pause time
P1014	Inertia
P1015	Friction
P87	Speed P
P88	Speed I
P444	Prop. Filter
P91	Flux P
P92	Flux I
P493	Voltage P
P494	Voltage I
P18	Ramp shape
P663	S acc t const
P664	S dec t const
P1016	Aux spd fun sel
P445	Speed up gain
P446	Speed up base
P447	Speed up filter
P696	Droop gain
P697	Droop filter
P698	Load comp
P700	Droop limit
P699	Enable droop
P242	Enable spd reg (1)
P453	Arm resistance
P454	Arm inductance
P469	Flux reg mode
P66	Select Analog output 1

(1) w amp. enab.: if this parameter is enabled, the DC Drive operates with the speed reference; otherwise, it operates with the torque reference.

5.14 Functions

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P67	Select Analog output 2
P68	Select Analog output 3
P69	Select Analog output 4
P70	Select Analog input 1
P75	Select Analog input 2
P80	Select Analog input 3
P145	Digital output 1
P146	Digital output 2
P147	Digital output 3
P148	Digital output 4
P137	Digital input 1
P138	Digital input 2
P139	Digital input 3
P140	Digital input 4
P141	Digital input 5
P142	Digital input 6
P143	Digital input 7
P144	Digital input 8
P101	Spd threshold +
P102	Spd threshold -
P103	Threshold delay
P104	Set error
P105	Set delay
P107	Speed zero level
P108	Speed zero delay
P627	Speed 0 trip delay
P243	Enab multi rmp
P1265	Enable Ramp in=0
P1295	Enable Torque pr
P1262	Closing speed
P1293	Torque delay
P1294	Torque proving
P1368	Min Trq proving
P1266	Actuator delay

FUNCTIONS

5.14.9 L/n curve

Using this function, the **In use Tcur lim + / -** current limits can be changed according to the motor speed with a six-segment curve; the parameters for defining the curve are **I/n speed** and **I/n lim 0-1-2-3-4**.
The **I/n speed** parameter defines a speed range below which current limits are maintained at the value of **I/n lim 0**, while the speed range between **I/n speed** and 100% of the maximum speed is divided into four equal segments,
in which the current limit decreases linearly from the value set in **I/n lim n** to the value set in **I/n lim n+1**.
The set values must decrease from **I/n lim 0** to “**I/n lim 4**.

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
FUNCTIONS \ I/n curve										
I/n curve Enabled Disabled	750	U16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-
I/n lim 0 [%]	751	U16	0	200	0		Yes	R/Z	-	-
I/n lim 1 [%]	752	U16	0	200	0		Yes	R/Z	-	-
I/n lim 2 [%]	753	U16	0	200	0		Yes	R/Z	-	-
I/n lim 3 [%]	754	U16	0	200	0		Yes	R/Z	-	-
I/n lim 4 [%]	755	U16	0	200	0		Yes	R/Z	-	-
I/n speed [rpm]	756	U16	0	P162	0		Yes	R/Z	-	-

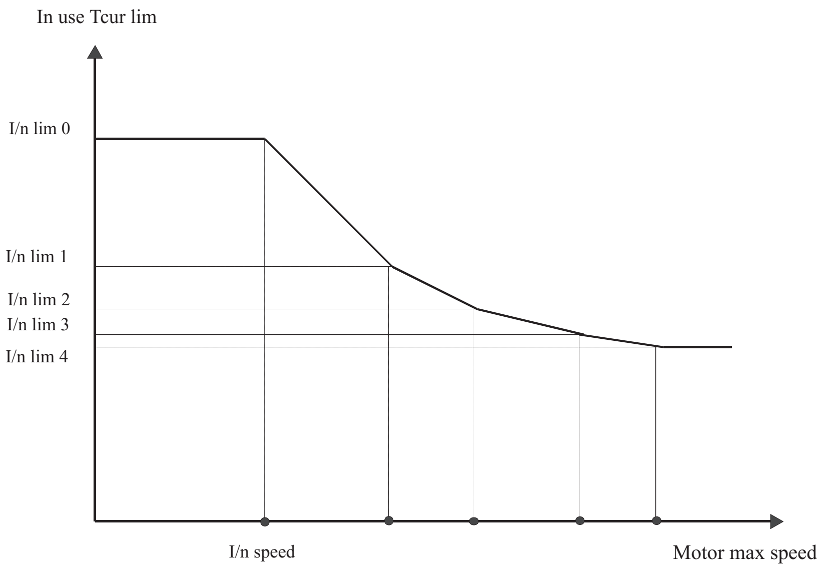


Figure 5.14.9.1: L/n curve.

I/n curve	Enabled	Speed-based current limitation enabled
	Disabled	Speed-based current limitation disabled
I/n lim 0	Limitation of constant current up to the speed set by the **I/n speed** parameter.	
I/n lim 1	Limitation 1 for construction of the I/n curve.	
I/n lim 2	Limitation 2 for construction of the I/n curve.	
I/n lim 3	Limitation 3 for construction of the I/n curve.	
I/n lim 4	Limitation 4 for construction of the I/n curve.	
I/n speed	Speed threshold beyond which limitation commences.	

SPECIFIC FUNCTIONS Test generator, saving, factory settings, failures, signal adaptation, words

5.15.1 Test generator

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
SPEC FUNCTIONS \ Test generator										
Generator access	58	U16	0	5	Not conn.		Yes	R/Z	-	-
Not connected								0		
T current ref								2		
Flux ref								3		
Ramp ref								4		
Speed ref								5		
Gen frequency [Hz]	59	Float	0.1	62.5	0.1		Yes	R/W	-	-
Gen amplitude [%]	60	Float	0	200.00	0		Yes	R/W	-	-
Generator offset [%]	61	Float	-200.00	+200.00	0		Yes	R/W	-	-

The “Test generator” function of the DC drive is used for manual calibration of the regulators. It consists of a square-wave signal generator whose frequency, offset and amplitude can be adjusted.

The output signal of the “Test generator” can be assigned to a programmable analog output.

Generator access Assigns the value of the generator output to the parameter concerned.
Gen frequency Output frequency of the generator in Hz.
Gen amplitude Amplitude of the square-wave signal produced by the generator, as a %.
Gen offset Offset of the generator as a %.

The generator output consists of the sum of **Gen amplitude** and **Gen offset**.

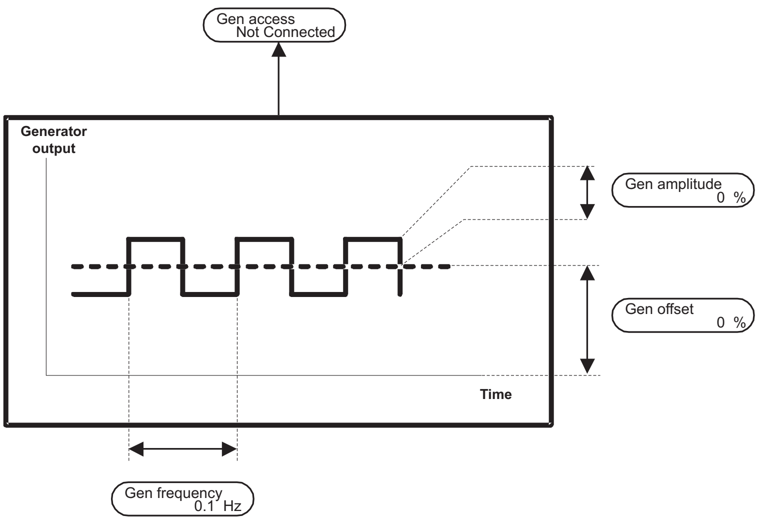


Figure 5.15.1.1: Test generator output.

SPECIFIC FUNCTIONS

5.15.2 Saving, loading default parameters, hour counter

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
SPEC FUNCTIONS										
Save parameters	256	U16					Yes	C/W(1)	-	-
Load default	258	U16					Yes	Z/C(1)	-	-
Life time [h.min]	235	Float	0	65535			Yes	R	-	-

Save parameters Saves the parameters. It is also possible to enable this command using the keyboard, even when the DC drive is controlled in Bus mode, in the **Control mode** parameter (CANopen option).

Load default Loads the default parameters («Default» column of the parameter tables).

Life time Counter indicating the time the DC drive is powered (even if disabled).

The default parameter values are set at the factory.
Note that any modification of and/or adjustments to parameters must be saved using the “Save parameters” command.

Note! The **Tacho scale** and **Speed offset** parameters are used for accurate calibration of the speed feedback circuit. When the factory parameters are loaded (**Load Default**) these two parameters do not change so that further calibration is not required!

SPECIFIC FUNCTIONS

5.15.3 Fault register

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
SPEC FUNCTIONS										
Failure register	330	U16	1	10	10		Yes	R/W	-	-
Failure text	327	Text					-	R	-	-
Failure hour	328	U16	0	65535				R	-	-
Failure minute	329	U16	0	59				R	-	-
Failure code	417	U16	0	65535				R	-	-
Failure supply								5100h		
Undervoltage								3120h		
Overvoltage								3310h		
Overcurrent								2300h		
Heatsink								4210h		
Hardware								5000h		
DSP error								6110h		
Interrupt error								6120h		
Speed fbk								7301h		
External fault								9000h		
Overtemp motor								4310h		
Field loss								3330h		
Bus loss								8110h		
Hw opt 1 failure								7510h		
Opt2								7400h		
Unknown								1001h		
Enable seq err								9009h		
Brake error								9090h		
I2t ovrld error								7120h		
Failure reset	262	U16					Yes	Z/C (1)	ID (H)	W
Failure reg del	263	U16					Yes	C	-	-

Failure register The fault register contains the last ten faults. It also contains information on the time of the fault, based on the DC drive operation counter (**Life time**), and information on the type of fault. This information can be accessed by pressing the ENT key on the keyboard when a fault is indicated. If different faults occur simultaneously, all faults are stored in the fault register until a fault occurs causing blockage of the DC drive (Latch = ON, see Programmable alarms). The contents of the fault register can also be read using the bus device (CANopen option) or serial interface.

Failure reset Resets the fault. When a fault is stored on the keyboard, it can be reset by pressing the CANC key. If, however, a number of faults occur in succession, these can only be reset using the general **Failure reset** command, by pressing ENT. When the DC drive is controlled by the bus system (**Control mode** =Bus), the keyboard can be used to turn off an alarm simply by entering the password **Pword 1**. To reset faults using a digital input, Status 1 must be used.

Failure reg del Clears the fault register.

SPECIFIC FUNCTIONS

To access information on the last ten faults using the serial line:
- Set the **Pointer** parameter [330], to identify the fault in the register.

For example, If set to 10, the last fault in the register will be indicated.
- Reading: **Failure text** [327], **Failure hour** [328], **Failure min**[329]; these parameters indicate the type of alarm and the time it occurred.

SPECIFIC FUNCTIONS

5.15.4 Calculations (Link 1...Link 6)

Parameter		N.						Format	Value			Access via			
		link1	link2	link3	link4	link5	link6		min.	max	Factory	keyp.	RS	Term.	D/P
SPECIAL FUNCTIONS \ Links \ Link 1 … 6															
Source	*link n.*	484	553	1218	1227	1236	1245	U16	0	65535	0	Yes	R/W	-	-
Destination	*link n.*	485	554	1219	1228	1237	1246	U16	0	65535	0	Yes	R/W	-	-
Mul Gain.	*link n.*	486	555	1220	1229	1238	1247	Float	-10000	+10000	1	Yes	R/W	-	-
Div. Gain	*link n.*	487	556	1221	1230	1239	1248	Float	-10000	+10000	1	Yes	R/W	-	-
Input max	*link n.*	488	557	1222	1231	1240	1249	Float	-2^{31}	$2^{31}-1$	0	Yes	R/W	-	-
Input min	*link n.*	489	558	1223	1232	1241	1250	Float	-2^{31}	$2^{31}-1$	0	Yes	R/W	-	-
Input Offset	*link n.*	490	559	1224	1233	1242	1251	Float	-2^{31}	$2^{31}-1$	0	Yes	R/W	-	-
Output offset	*link n.*	491	560	1225	1234	1243	1252	Float	-2^{31}	$2^{31}-1$	0	Yes	R/W	-	-
Input absolute	*link n.*	492	561	1226	1235	1244	1253	U16	0	1	OFF	Yes	R/W	-	-
ON													1		
OFF											(0)		0		

Tpar link_0484_1253

The Link 1 to Link 6 functions are calculations that operate independently of each other to allow the adaptation of signals. The parameters with these links can be:
- corrected
- limited
- multiplied by a factor
- divided by a factor
- equipped with an offset
- processed as an absolute value

Source Number of parameter used as an input value. To enter the source parameter number correctly, the value 2000H (8192 decimal) must always be added to it.
For example, if the source parameter is **Speed ref 1** (42), it should be given the value 8192 + «42» = 8234

Destination Number of the parameter determining the output value. As above, always add +2000H (8192 decimal) to the chosen parameter number.
For example, If the output value must be used as a **T current ref 1** (39) torque reference, enter 8192 + «39» = 8231.

The parameter numbers can be found in the list in Chapter 8 of this guide.

Mul gain Multiplier factor of the input value after limitation. Result: 5 digits.

Div gain Divisor to be used to divide the multiplied and limited input value. Result: 5 digits.

Input max Maximum limit of the input value. Result: 5 digits.

Input min Minimum limit of the input value. Result: 5 digits.

Input offset Offset added to the input value. Result: 5 digits.

5.15 Specific functions

SPECIFIC FUNCTIONS

Output offset Offset added to the output value. Result: 5 digits.

Inp absolute This parameter can be used to define input behaviour.

OFF	The polarity of the input value is processed.
ON	The absolute value of the input value is processed. It is possible to change polarity with the **Mul gain** and **Div gain** signs.

The calculations are executed in an approximate period of 20 ms.
They should not be used for regulation purposes, but rather to assign and adapt parameters that are not directly accessible.
The use of calculations can overload the DC drive CPU and reduce keyboard and display speed.
Users should check that functionality suits their needs before embarking on major tasks.

Note ! The parameters below cannot be used as destinations of calculations:

- Any parameter that only has an «R» access code
- Any parameter that only has a «Z» access code
- Any parameter that only has an «C» access code
- All of the following parameters:

Parameter No.	Parameter description
19	S shape t const
72	Scale input 1
73	Tune value inp 1
77	Scale input 2
78	Tune value inp 2
82	Scale input 3
85	Pword1
83	Tune value inp 3
86	Password 2
318	Overload mode
408	Ser answer delay
425	Enable OPT2
444	Prop. Filter [ms]
453	Arm resistance [ ]
454	Arm inductance [mH]
456	Flux weak speed [%]
467	Flux current max [%]
468	Flux current min [%]
470	Hold off time [ms]
474	Restart time [ms]
475	Hold off time [ms]
480	Hold off time [ms]
482	Hold off time [ms]
483	Restart time [ms]
484	Source
485	Destination
501	Restart time [ms]
502	Hold off time [ms]
553	Source
554	Destination
562	Tacho scale
585	Restart time [ms]
586	Hold off time [ms]
636	Hold off time [ms]

SPECIFIC FUNCTIONS

637	Restart time [ms]
649	Refresh enc 1
652	Refresh enc 2
663	S acc t const
664	S dec t con
665	S acc t const 0
666	S dec t const 0
667	S acc t const 1
668	S dec t const 1
669	S acc t const 2
670	S dec t const 2
671	S acc t const 3
672	S dec t const 3
776	PI central V1
785	PI bottom lim
786	PID source
792	Input 1 filter [ms]
1012	Inertia c filter [ms]
1013	Torque const [N*m/A]
1014	Inertia [kg*m*m]
1015	Friction [N*m]
1042	Input 1 compare
1043	Input 1 cp error
1044	Input 1 cp delay

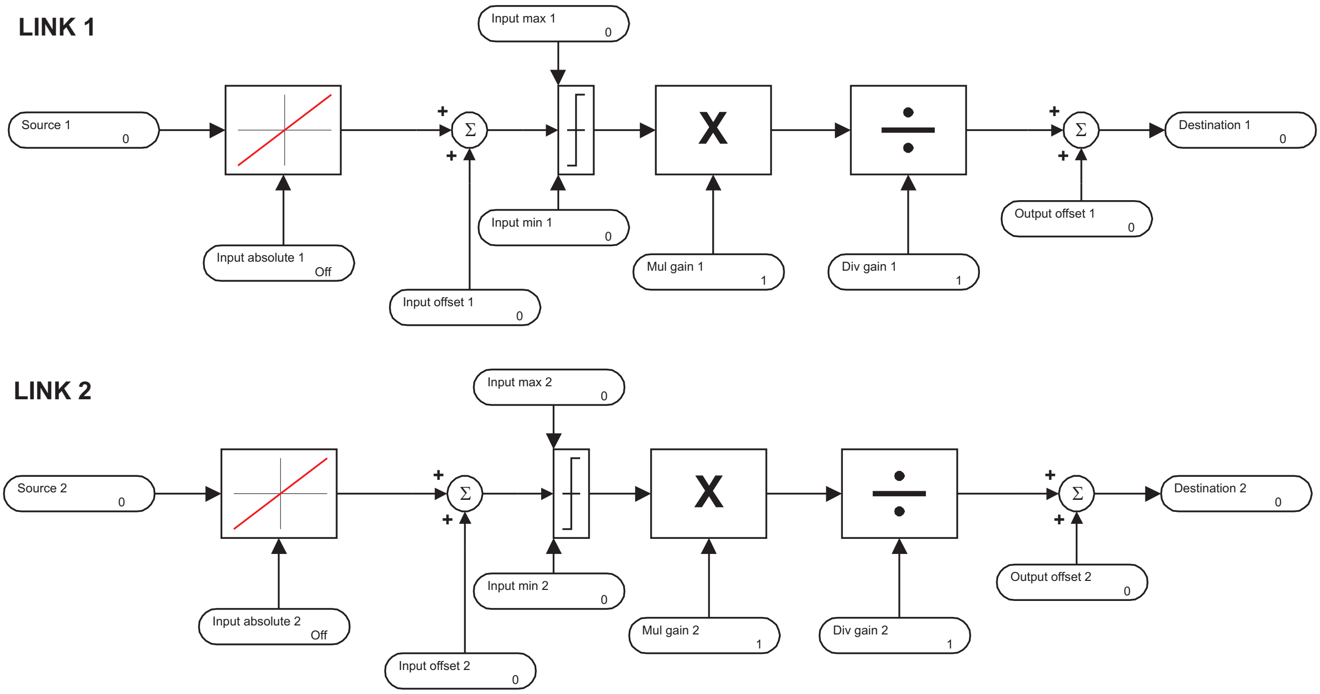


Figure 5.15.4.1: Synopsis of calculations.

SPECIFIC FUNCTIONS

5.15.5 Pads

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
SPEC FUNCTIONS \ Pad Parameters										
Pad 0	503	I16	-32768	+32767	0	(A), (C)	Yes	R/W	IA, QA	R/W
Pad 1	504	I16	-32768	+32767	0	(A), (C)	Yes	R/W	IA, QA	R/W
Pad 2	505	I16	-32768	+32767	0	(C)	Yes	R/W	IA	R/W
Pad 3	506	I16	-32768	+32767	0	(C)	Yes	R/W	IA	R/W
Pad 4	507	I16	-32768	+32767	0	(A)	Yes	R/W	QA	R/W
Pad 5	508	I16	-32768	+32767	0	(A)	Yes	R/W	QA	R/W
Pad 6	509	I16	-32768	+32767	0	(A)	Yes	R/W	QA	R/W
Pad 7	510	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 8	511	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 9	512	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 10	513	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 11	514	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 12	515	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 13	516	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 14	517	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 15	518	I16	-32768	+32767	0		Yes	R/W	-	R/W
Bitword pad A	519	U16	0	65535	0	(E), (D)	Yes	R/W	ID*,QD*	R/W
Pad A Bit 0	520	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W
Pad A Bit 1	521	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W
Pad A Bit 2	522	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W
Pad A Bit 3	523	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W
Pad A Bit 4	524	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W
Pad A Bit 5	525	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W
Pad A Bit 6	526	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W
Pad A Bit 7	527	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W
Pad A Bit 8	528	U16	0	1	0		-	R/W	QD*	-
Pad A Bit 9	529	U16	0	1	0		-	R/W	QD*	-
Pad A Bit 10	530	U16	0	1	0		-	R/W	QD*	-
Pad A Bit 11	531	U16	0	1	0		-	R/W	QD*	-
Pad A Bit 12	532	U16	0	1	0		-	R/W	QD*	-
Pad A Bit 13	533	U16	0	1	0		-	R/W	QD*	-
Pad A Bit 14	534	U16	0	1	0	(H)	-	R/W	QD*	-
Pad A Bit 15	535	U16	0	1	0		-	R/W	QD*	-
Bitword pad B	536	U16	0	65535	0	(D)	Yes	R/W	QD*	R/W
Pad B Bit 0	537	U16	0	1	0	(D)	-	R/W	QD	R
Pad B Bit 1	538	U16	0	1	0	(D)	-	R/W	QD	R
Pad B Bit 2	539	U16	0	1	0	(D)	-	R/W	QD	R
Pad B Bit 3	540	U16	0	1	0	(D)	-	R/W	QD	R
Pad B Bit 4	541	U16	0	1	0	(D)	-	R/W	QD	R
Pad B Bit 5	542	U16	0	1	0	(D)	-	R/W	QD	R
Pad B Bit 6	543	U16	0	1	0	(D)	-	R/W	QD	R
Pad B Bit 7	544	U16	0	1	0	(D)	-	R/W	QD	R
Pad B Bit 8	545	U16	0	1	0		-	R/W	QD*	-
Pad B Bit 9	546	U16	0	1	0		-	R/W	QD*	-
Pad B Bit 10	547	U16	0	1	0		-	R/W	QD*	-
Pad B Bit 11	548	U16	0	1	0		-	R/W	QD*	-
Pad B Bit 12	549	U16	0	1	0		-	R/W	QD*	-
Pad B Bit 13	550	U16	0	1	0		-	R/W	QD*	-
Pad B Bit 14	551	U16	0	1	0	(H)	-	R/W	QD*	-
Pad B Bit 15	552	U16	0	1	0		-	R/W	QD*	-

SPECIFIC FUNCTIONS

(A) This parameter can be assigned to a programmable analog output.
(C) This parameter can be assigned to a programmable analog input.
(D)This parameter can be assigned to a programmable digital output.
(E) This parameter can be assigned to a programmable digital output.
(H) This parameter can be assigned to Relay 2

Pads are used to exchange data, they can be compared to internal variables of a PLC. Figure 5.15.5.1 illustrates the general system structure. Using Pads, it is possible to send information from a fieldbus to an option board. All PADs can be read and written. See the different possibilities for access in the list of all parameters in Chapter 8.

Pad 0...15 — 16-bit words. Words 0 to 3 can be assigned to analog inputs. Words 0, 1, 4, 5 and 6 can be assigned to analog outputs.

Bitword pad A (B) — Bitmap of Pad A (B) bit 0, up to Pad A (B) bit 15. With a parameter, it is possible to read or write all bits inside a word.

For example:

Pad A bit 0	0		
Pad A bit 1	1	$= 2^1$	=2
Pad A bit 2	0		
Pad A bit 3	0		
Pad A bit 4	0		
Pad A bit 5	1	$= 2^5$	= 32
Pad A bit 6	1	$= 2^6$	= 64
Pad A bit 7	0		
Pad A bit 8	0		
Pad A bit 9	0		
Pad A bit 10	1	$= 2^{10}$	= 1024
Pad A bit 11	0		
Pad A bit 12	1	$= 2^{12}$	= 4096
Pad A bit 13	0		
Pad A bit 14	0		
Pad A bit 15	0		

Bitword pad A = 2 + 32 + 64 + 1024 + 4096 = 5218

Pad A (B) bit 0...15 — Word bits. Simple bits can be read and written. With **Bitword Pad A** (B) it is possible to process a word.

Using word bits, it is possible to read the status of digital inputs 1 to 8 by assigning them to bits 0 to 7 respectively (word A only).

It is also possible to assign digital outputs to the bitmap of word A or B:

Output 1	Pad A (B) bit 0	(0001H , 1 decimal)
Output 2	Pad A (B) bit 1	(0002H , 2 decimal)
Output 3	Pad A (B) bit 2	(0004H , 4 decimal)
Output 4	Pad A (B) bit 3	(0008H , 8 decimal)
Output 5	Pad A (B) bit 4	(0010H , 16 decimal)
Output 6	Pad A (B) bit 5	(0020H , 32 decimal)
Output 7	Pad A (B) bit 6	(0040H , 64 decimal)
Output 8	Pad A (B) bit 7	(0080H , 128 decimal)
Relay 2	Pad A (B) bit 14	(4000H, 16384 decimal)

SPECIFIC FUNCTIONS

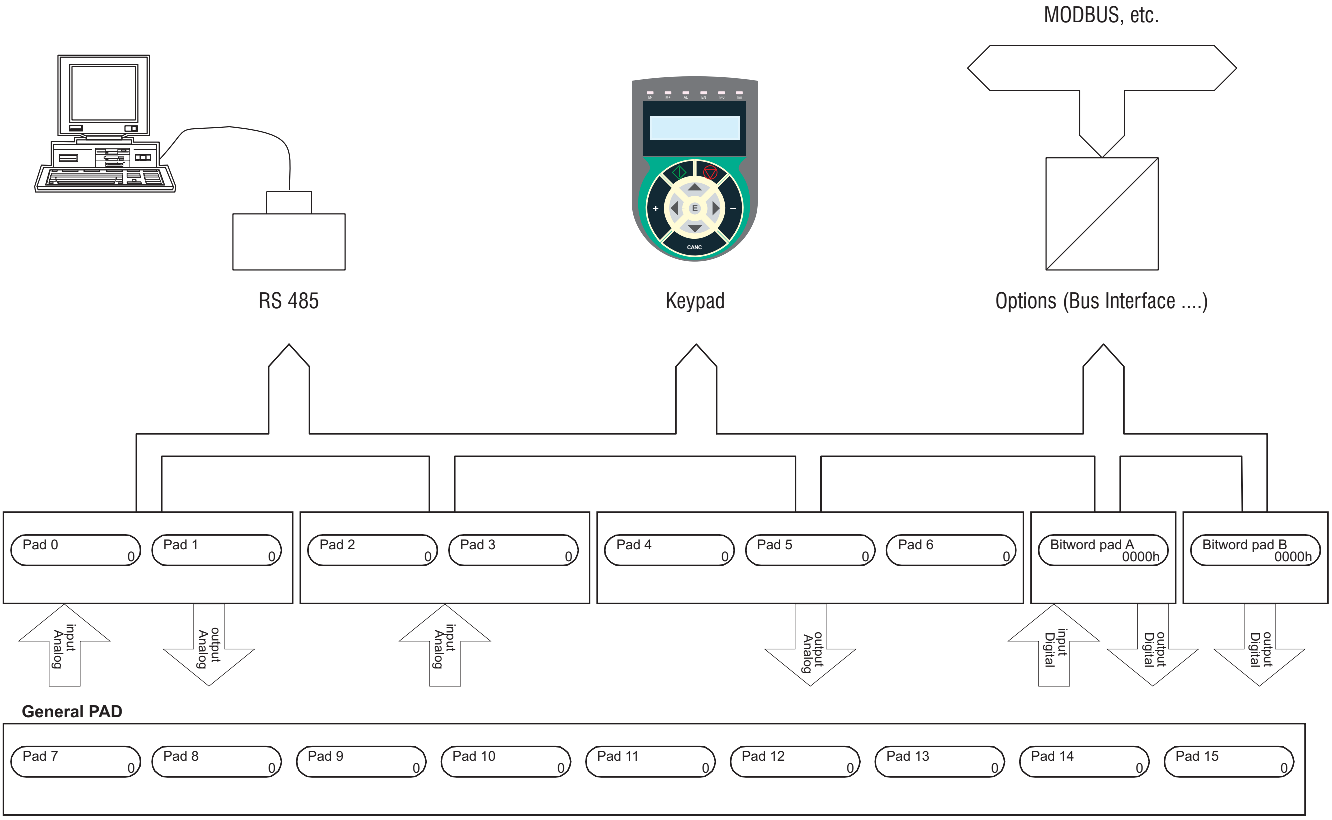


Figure 5.15.5.1: Data exchange between system components.

5.16 Options

OPTIONS	PID, winder/unwinder

5.16.1 Option 1

CANopen DCVS5Z27 communications board and DC drive interface menu.
Using this menu, the DC drive parameters can be assigned to the virtual digital inputs and outputs (MONITOR menu\Virtual digital Inp-Out) and process channels (PDC) of the communications bus.
If the communications board is not present, the "OPT1 not present" message is displayed.
If the communications board used has not been updated for this management, the "OPT1 old version" message is displayed.
For further information, please see the User Guide for the DCVS5Z27 board.

5.16.2 Option 2

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
OPTIONS \ Option 1										
	Accessible only with optional DCVS5Z27 CANopen card									
OPTIONS \ Option 2										
Menu	Accessible only with optional DCVS5W04 card									
Enable OPT2	425	U16	0	1	Disabled		Yes	R/Z	-	-
Enabled								1		
Disabled					(0)			0		

This menu allows access to the set of parameters of the programming and development board for DCVS5W04 applications.

Menu

The menu is only enabled if a DCVS5W04 board is installed.

If you try to access the OPT2 menu when the optional board is not installed, the «OPT2 not present» message is displayed.

For further information, please refer to the User Guide for the DCVS5Z27 board.

Enable OPT2

Enabled — When the DC drive is powered, the presence of the board is checked. If this board is present, the "Menu" parameters are enabled and it is possible to access the board parameters.

Disabled — When the DC drive is powered, the presence of the board is not checked. Therefore, the optional parameters are not taken into account, even if the board is present.

Default setup = Disabled.

To change the validation status:

1 - Change the value of **Enable OPT2**
2 - Save the new settings using **Save parameters** (BASIC MENU)
3- The DC drive only takes into account enabling or failure to enable after the power is reconnected to the DC drive control (Init)

If parameter Enable OPT2 is enabled and the optional board DCVS5W04 is not installed, the error message «OPT2 failure code 100-98» or «OPT2 failure code 100-96» is displayed.

Note: When using an optional OPT2 board, all of the parameters in the list of parameters are accessible by automatic asynchronous «D/P» communication (see Chapter 8.1). The parameters in the «List of hi-priority parameters» (Chapter 8.2) can be accessed through the automatic synchronous communication system (see the User Guide for the DCVS5W04 board).

OPTIONS

5.16.3 PID function

5.16.3.1 General information

The PID function of the DCVN DC drive has been specially designed for control of S blocks, winders and unwinders, and to control the pressure of pumps and extruding machines. Therefore, in addition to the PID regulator, the DC drive has other blocks of functions needed for optimum control.

It is possible to use the main block as well as the generic PID

The inputs (except for those of transducers) and outputs are configurable and can hence be assigned to various DC drive parameters. For example, the PID block output can be destined either the speed or current regulators.

The analog inputs and outputs are sampled or updated every 2ms.

The digital inputs and outputs are sampled or updated every 8ms.

Note! Enabling of the optional DCVS5W04 board (Option 2) prevents use of the PID function.

5.16.3.2 Inputs/Outputs

Regulation inputs/outputs

PID source PID regulator input reference (Feed-Forward) normally programmed on an analog input.

PID feed-back Analog input of position/traction transducer (dancer/load cell).

PID feed-back is normally programmed on analog input 1, which is equipped with a filter.

PID offset 0 Analog input added to **PID feed-back**. It can be used for centering the position of the dancer.

PID target Destination parameter associated with the regulator output. It is normally assigned to the speed reference of the DC drive.

PID output Regulator output. It can be used to create a cascade of references in multiple DC drive systems.

PI central v3 Setting of initial value of the integral component of the regulator (corresponding to the initial diameter). This parameter can be assigned to an analog input that is connected, for instance, to an ultrasonic transducer used to measure the diameter of a winder/unwinder.

Command inputs (programmable on digital inputs)

Enable PI PID Enabling of the PI (proportional - integral) part of the PID regulator. The switch from input Status 0 to Status 1 also causes automatic acquisition of the value of the integral component corresponding to the initial diameter.

Enable PI PID Enabling of the PD (proportional - derived) part of the regulator.

PI integral freeze Freezing of the current value of the integral component of the regulator.

PID offset sel Selection of offset added to **PID feed-back**:
Status 0 = **PID offset 0**, Status 1 = **PID offset 1**.

OPTIONS

PI central v S0 and
PI central v S1 Selector for choosing between the initial «**PI central v**» parameter (corresponding to the initial diameter) using a binary combination.

Diameter calc Enabling of the initial diameter calculating function.

Diameter calc st Calculation of the end diameter (digital output).

5.16.3.3 Feed – Forward

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
OPTIONS \ PID \ PID source										
PID source	786	U16	0	65535	0		Yes	R/W	-	-
PID source gain	787	Float	-100.000	+100.00	1.000		Yes	R/W	-	-
Feed-fwd PID	758	I16	-10000	+10000	0	(C)	Yes	R	IA	R

(C) This parameter can be assigned to a programmable analog input.

The Feed-Forward signal represents the main reference of the regulator. It is processed by the PID function inside the regulator before being sent to the output as a reference signal for the DC drive.

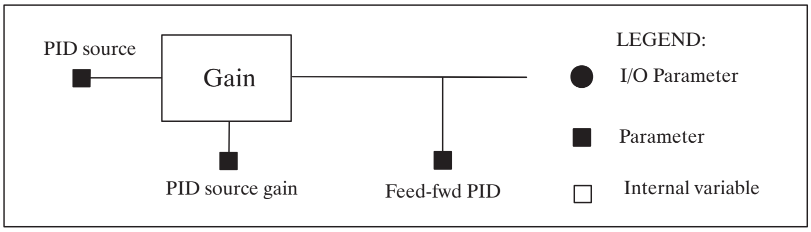


Figure 5.16.3.1: Feed-Forward block description.

PID source PID regulator input reference (Feed-Forward). PID source is not directly assignable. For the real address, +2000H (8192 decimal) must be added to the parameter number.

PID source gain Multiplier factor of the value of the PID source input.

Feed-fwd PID Display of the Feed-Forward value

Using the **PID source** parameter, it is possible to select the variable in the DC drive to be read as the Feed-Forward signal; the selectable parameters are indicated in Chapter 8.2 "List of high-priority parameters" and the units of measurement are indicated in the notes at the end of the chapter.

1. **Example of programming of ramp status output (Ramp out parameter) on PID source:**

   Menu OPTION
   ——> PID
   ——> PID source
   ——> PID source = 8305

   At **PID source**, select the number of the parameter to be assigned to the decimal number 113 from the list in Chapter 8.2 "**Ramp out**". To obtain the real address, 8192 must be added: 8192 + 113 = 8305.

OPTIONS

When Feed-Forward is set to the analog input, since these are not directly inserted into the high-priority parameters, it is not necessary to go through an intermediate task word **PAD 0... PAD 15**.

2. **Example of programming analog input 2 on PID source:**

1) Assignment of input to a task word **PAD**

Menu I/O CONFIG
——> Analog input
——> Analog input 2
——> Select input 2 = PAD 0

2) Assignment of **PAD 0** as Feed-Forward input:

Menu OPTION
————> PID
————> PID source
————> PID source = 8695

From the same list of high-priority parameters in Chapter 8.2, “**PAD 0**” to the decimal number 503. To obtain the real address, 8192 must be added:
8192 + 503 = 8695

The full scale of the Feed-Forward parameter is limited to the value +/- 10000, which means that regardless of the parameter set to **PID source**, it will be necessary to adjust the calibration using the **PID source gain** parameter.
It is possible to read the Feed-Forward value using the **Feed-fwd PID** parameter.

Calculation of the calibration gain of the PID source gain parameter:
Taking up the two examples above:

1. Example of programming of ramp status output (Ramp out parameter) on PID source:
- The maximum value taken by the ramp input references will be that set in Speed base value.
- The DC drive works on and carries out these calculations internally, at a speed in RPM multiplied by 4

Thus,
Feed - fwd PID = Speed base value x 4 x PID source gain

If, with a maximum ramp reference Speed base value = 3000 RPM, and Feed - fwd PID = 10000 is not to be exceeded, set:

PID source gain = 10000 / (3000 x 4) = 0.833

2. Example of programming analog input 2 on **PID source**:

When an analog input is assigned to a **PAD**, this will have a maximum value of + / - 2047.

If, with a maximum analog reference, **Feed - fwd PID** = 10000 is required, set:

PID source gain = 10000 / 2047 = 4.885.

Note! For systems in which the regulator is to be used as a «generic PID» without the Feed-forward function, the Feed-fwd PID function must be at its maximum value. For this, it is necessary to set PID source on a PAD and to set the latter with a value = 10000.

OPTIONS

5.16.3.4 PID function

The PID function is divided into three blocks:
Feed-back input, “**PID reference**” submenu
Proportional-integral control block, “**PI controls**” submenu
Proportional-derivative control block, “**PI controls**” submenu

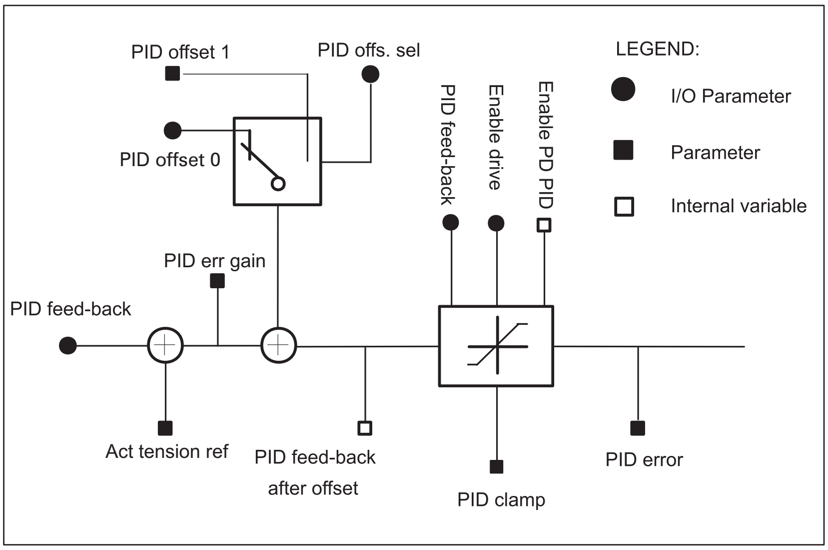


Figure 5.16.3.2: PID block description.

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
OPTIONS \ PID \ PID references										
PID error	759	I16	-10000	+10000	0		Yes	R	-	R
Act tension ref	1194	Float	0.00	200.00	0		Yes	R	-	R
PID feed-back	763	I16	-10000	+10000	0	(C)	Yes	R/W	IA	R/W
PID offs. Sel Offset 1 Offset 0	762	U16	0	1	0	(E)	Yes	R/W 1 0	ID	R/W
PID offset 0	760	I16	-10000	+10000	0	(C)	Yes	R/W	IA	R/W
PID offset 1	761	I16	-10000	+10000	0		Yes	R/W	-	-
PID acc time	1046	Float	0.0	900.0	0.0		Yes	R/W	-	-
PID dec time	1047	Float	0.0	900.0	0.0		Yes	R/W	-	-
PID err gain [%]	1254	Float	0.00	32.00	1		Yes	R/W	-	-
PID clamp	757	I16	-10000	+10000	10000		Yes	R/W	-	-

(C) This parameter can be assigned to a programmable analog input.
(E) = This parameter may be assigned to a programmable digital input.

PID error Error reading PID function input (below **PID clamp** block).

Act tension ref Monitoring of torque reference as a reduced % of the Taper function % set using **Tension red;** if the Taper function is not enabled, **Act tension** ref corresponds to **Tension ref**.

PID feed-back Reading of the feed-back value of the position (dancer) or traction (load cell) transducer.

OPTIONS

PID offs. sel Selection of offset added to **PID feed-back**:
Status 0 = **PID offset 0**, Status 1 = **PID offset 1**.
This parameter can be set on a programmable digital input.

PID offset 0 Offset 0 added to **PID feed-back**. This parameter can be set on an analog input, for calibration of the feedback sensor, for example.

PID offset 1 Offset 1 added to **PID feed-back**.

PID acc time Ramp acceleration time in seconds after **PID offset** block.

PID dec time Ramp deceleration time in seconds after **PID offset** block.

PID err gain % of **PID error** gain.

PID clamp This clamp allows the smooth traction setting of a winder/unwinder system when the "Initial diameter calculation function" cannot be used.
If, for instance, when the DC drive is enabled, the dancer is at its far point and **PID error** is at its maximum value, the motor may undergo a very sudden acceleration to reel the dancer back to its central working position.
By setting **PID clamp** to a sufficiently low value, e.g. = 1000, on starting up the DC drive and after enabling **Enable PD PID**, the value of **PID error** is limited to 1000 until the signal from the dancer (**PID feed-back**) drops back down to this value.
At this point, **PID clamp** is automatically taken back to its maximum value = 10000. The clamp is held at 10000 until the next time the DC drive or **Enable PD PID** parameter is locked.

The feed-back input is designed for connection to an analog transducer - as a dancer potentiometer or load cell. However, it is possible to use this input as a comparison between any two + / - 10V analog signals.

Connection to a dancer with potentiometer connected between - 10 and + 10V.

The potentiometer cursor can be connected to any of the analog inputs of the DC drive, though analog input 1 is normally used (terminals 1 and 2) since it is equipped with a filter.
The input chosen for this connection should be programmed in the **I/O CONFIG** menu as **PID feed-back** and its value can be read in the **PID feed-back** parameter of the **"PID reference"** submenu.
It is possible to centre the dancer position through **PID offset 1** (or PID offset 0).

Connection to a load cell 0... + 10V.

This is connected and configured as indicated above.
The traction setting can be connected at 0...-10V, to one of the remaining analog entries in the **I/O CONFIG** menu, such as **PID offset 0**.

OPTIONS

5.16.3.5 Proportional-Integral (PI) control block

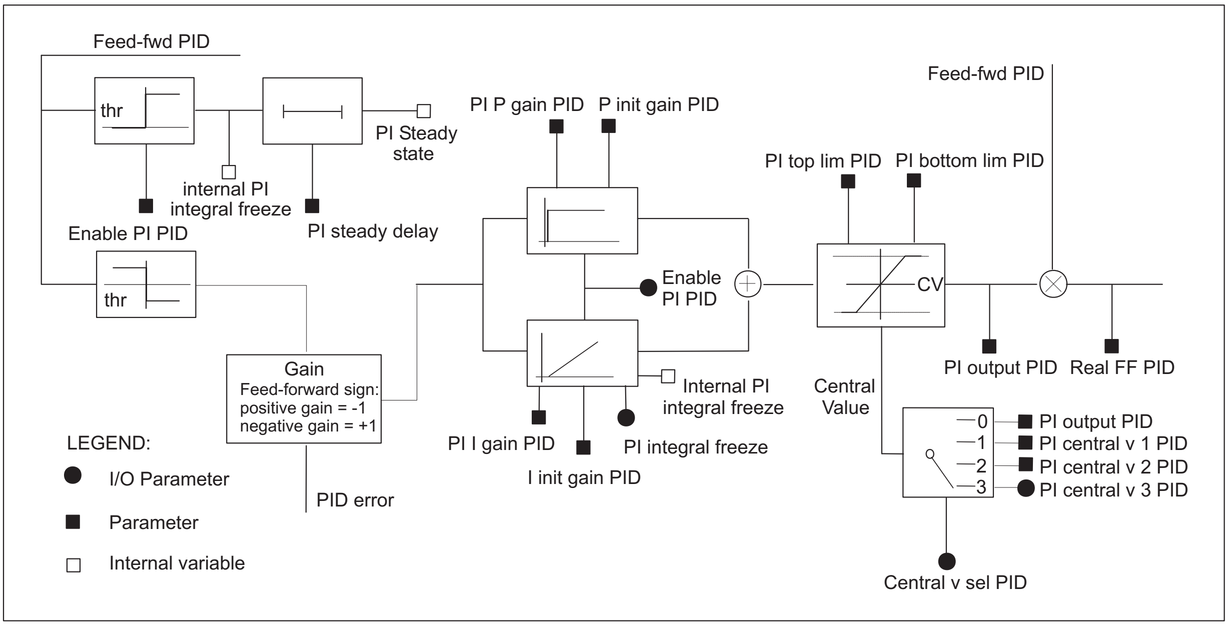


Figure 5.16.3.3: PI block description.

The PI block receives input from the **PID error** parameter, which represents the error that must be dealt with by the regulator. The PI block uses proportional-integral regulation. After its output **PI output PID** has been adapted to the system to be controlled, it is used as a feed-forward multiplier factor (**Feed-fwd PID**), for obtaining the correct speed reference value for the DC drive (**Real FF PID**).

Enabling/disabling

The PI block is enabled by programming **Enable PI PID** = enable. If the **Enable PI PID** parameter has been assigned to a digital input, this must be returned to Status 1.

Parameter	No.	Format	Value			Standard	Access via			
			min	max	Factory	Configurat.	Keyp.	RS	Term	D/P
OPTIONS \ PID										
Enable PI PID	769	U16	0	1	Disabled	(E)	Yes	R/W	ID	R/W
Enabled								1		
Disabled					(0)			0		

(E) = This parameter may be assigned to a programmable digital input.

Enable PI PID	Enabled	Enabling of Proportional-Integral block.
	Disabled	Disabling of Proportional-Integral block.

5.16 Options

OPTIONS

Control of PI block

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
OPTIONS \ PID \ PI controls										
PI P gain PID	765	Float	0.00	100.00	10.00		Yes	R/W	-	-
PI I gain PID	764	Float	0.00	100.00	10.00		Yes	R/W	-	-
PI steady thr	695	I16	0	10000	0		Yes	R/W	-	-
PID steady delay	731	U16	0	60000	0		Yes	R/W	-	-
P init gain PID	793	Float	0.00	100.00	10.00		Yes	R/W	-	-
I init gain PID	734	Float	0.00	100.00	10.00		Yes	R/W	-	-
PI central v sel	779	U16	0	3	1	(E)	Yes	R/W	ID	R/W
PI central v1	776	Float	PI bot lim	PI toplim	1.00		Yes	R/W	-	-
PI central v2	777	Float	PI bot lim	PI toplim	1.00		Yes	R/W	-	-
PI central v3	778	Float	PI bot lim	PI toplim	1.00	(C)	Yes	R/W	IA	-
PI top lim	784	Float	PI bot lim	10.00	10.00		Yes	R/W	-	-
PI bottom lim	785	Float	-10.00	PI toplim	0.00		Yes	R/W	-	-
PI integr freeze ON OFF	783	U16	0	1	OFF (0)	(E)	Yes	R/W 1 0	ID	R/W
PI output PID	771	I16	0	1000 x PI toplim	1000		Yes	R	-	R
Real FF PID	418	I16	-10000	+10000	0		Yes	R/W	-	R

(C) This parameter can be assigned to a programmable analog input.
(E) = This parameter may be assigned to a programmable digital input.

PI P gain PID Proportional gain of PI block

PI I gain PID Integral gain of PI block

PI steady thr Feed-Forward threshold.

If **Feed-fwd PID** is lower than **PI steady thr**, the proportional gain acts according to the value set in **P init gain PID**.

If **Feed-fwd PID** is higher than **PI steady thr**, the integral regulation component operates with the gain value regulated in **I init gain PID**. The PI block will then use the **P init gain PID** and **I init gain PID** gains for the time indicated on the **PI steady delay** timer . After this time, they will be returned to **PI P gain PID** and **PI I gain PID**, respectively.

PI steady delay Time in milliseconds during which the **P init gain PID** and **I init gain PID** gains are operational after exceeding the **PI steady thr** threshold.

The **PI steady delay** timer and hence the initial gains value changing function is also enabled when the **Enable PI PID** parameter is changed from Status 0 to Status 1.

P init gain PID Initial proportional gain of PI block.

I init gain PID Initial integral gain of PI block.

PI central v sel Initial PI block output selector. **PI central v sel** (0...3) defines which of the 4 possible settings of the initial value of the integral component of the regulator (corresponding to the initial diameter) is used.

5.16 Options

OPTIONS

PI central v S0	PI central v S1	PI central v sel	
0	0	0	PI output PID memorised value
0	1	1	PI central v 1
1	0	2	PI central v 2
1	1	3	PI central v 3 (assignable to an analog input)

PI central v sel can be set directly from the keyboard, serial link or two digital inputs programmed as **PI central v S0** and **PI central v S1**.

If **PI central v sel = 0** is selected when the PI block is disabled (**Enable PI PID** = Disable), the last value of the integral component (corresponding to current diameter) is stored in the memory and can be displayed in **PI output PID**.
When the PI block is re-enabled, regulation restarts with this value.
The same functionality is used when it is necessary to cut off the power supply to the DC drive.

By selecting **PI central v sel** = 1-2-3 when the PI block is disabled, the **PI output PID** value is set to that programmed in the corresponding parameter (x1000). When the variable speed drive is switched off and on again, the previously calculated value is automatically reloaded so long as the digital input assigned to **Enable PI PID** was at Status 1 when the DC drive was restarted.

PI central v 1 Setting of the first initial value of the integral component of the regulator (corresponding to the initial diameter 1). The value of **PI central v 1** must be within the limits of **PI top lim PID** and **PI bottom lim PID**.
PI central v 1 is selected by setting the **PI central v sel** parameter to 1.

PI central v 2 Setting of the second initial value of the integral component of the regulator (corresponding to initial diameter 2). The value of **PI central v 2** must be within the limits of **PI top lim PID** and **PI bottom** lim PID.
PI central v 2 is selected by setting the **PI central v sel** parameter to 2.

PI central v 3 Setting of the third initial value of the integral component of the regulator (corresponding to initial diameter 3). The value of **PI central v 1** must be within the limits of **PI top lim PID** and **PI bottom lim PID**.
PI central v 3 is selected by setting the **PI central v sel** parameter to 3.

PI top lim Upper limit of PI correction.

PI bottom lim Lower limit of PI correction.

The PI block output represents the Feed-Forward multiplier factor, whose value must be adapted by the regulator at the maximum limits of +10000 to -10000, and defined by PI top lim and PI bottom lim. The value of these parameters is defined according to the system to be controlled. For a better understanding of this topic, please refer to “Application examples”.

PI integral freeze “Freezing” of the current value of the integral component of the regulator.

PI output PID PI block output adapted to values between **PI top limit** and **PI bottom limit**. When the DC drive is enabled, **PI output PID** automatically acquires the value selected with PI central v sel multiplied by 1000.

Example: if **PI central v 2** = 0.5 is selected, when enabled, **PI output PID** has the value 500.

OPTIONS

When **Enable PI PID** is enabled, the **PI output PID** output correlates with the input error, as its value is integrated up to the limits set with **PI top limit** or **PI bottom limit** multiplied by 1000.

E.g.: **PI top limit** = 2, **PI output PID** max = 2000.

The PI block output is also limited by saturation of the **Real FF PID** parameter (see description of this parameter).

As described above, **PI output PID** is used as a multiplier factor of Feed-Forward to obtain the motor rpm reference. Therefore, in the event that the PID function is used to control a winder/ unwinder, its value is inversely proportional to the diameter of the winder.

When winding at a constant peripheral speed, it is possible to write:

$\omega_0 \, \Phi_0 = \omega_1 \, \Phi_1$

where:
ω_0 = motor rpm at the minimum diameter
Φ_0 = minimum diameter
ω_1 = motor rpm at the current diameter
Φ_1 = current diameter

Thus,

$\omega_1 = \omega_0 \text{ x } (\Phi_0 / \Phi_1)$

When the DC drive is set adequately, ω_0 corresponds to the maximum value of Feed-Forward.
Therefore, **PI output PID** depends on Φ_0 / Φ_1.
Taking into account the internal adjustment coefficients of the DC drive, it is possible to write:
PI output PID = (Φ_0 / Φ_1)x 1000
This formula can be used to check the precision of settings when the system is in operation or during the initial diameter calculation procedure.

Real FF PID Represents the value of Feed-Forward recalculated according to the PI correction. Based on this formula,

Real FF PID = (Feed-fwd PID / 1000**) x PI output PID**

The maximum value of **Real FF PID** is +/- 10.000. When this limit is reached during operation, any increase over **PI output PID** is blocked in order to prevent regulator saturation hazards.

Example: Feed-fwd = + 8000, the positive limit of **PI output PID** is automatically set to 10000 / (8000 / 1000) = 1250.

OPTIONS

5.16.3.6 Proportional-derivative (PD) control block

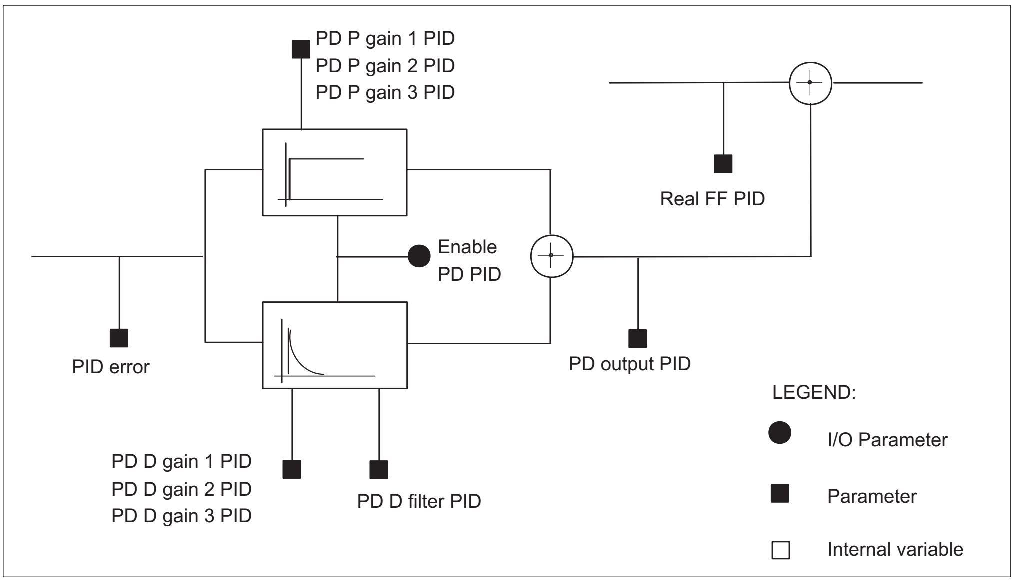


Figure 5.16.3.4: PD block description.

The PD block receives the **PID error** parameter at input, representing the error that needs to be corrected by the regulator. The PD block carries out proportional-derivative regulation and its output **PD output PID** is added directly to **Real FF PID**.

Enabling/disabling

The PD block is enabled by setting **Enable PD PID** = enable. If the **Enable PI PID** parameter has been assigned to a digital input, this must be set to Status 1.

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
OPTIONS \ PID										
Enable PD PID	770	U16	0	1	Disabled	(E)	Yes	R/W	ID	R/W
Enabled								1		
Disabled					0			0		

(E) = This parameter may be assigned to a programmable digital input.

Enable PD PID	Enabled	Enabling of the proportional-derivative block
	Disabled	Disabling of the proportional-derivative block

5.16 Options

OPTIONS

Control of PD block

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
OPTIONS \ PID \ PD control										
PD P gain 1 PID [%]	768	Float	0.00	100.00	10.00		Yes	R/W	-	-
PD D gain 1 PID [%]	766	Float	0.00	100.00	1.00		Yes	R/W	-	-
PD P gain 2 PID [%]	788	Float	0.00	100.00	10.00		Yes	R/W	-	-
PD D gain 2 PID [%]	789	Float	0.00	100.00	1.00		Yes	R/W	-	-
PD P gain 3 PID [%]	790	Float	0.00	100.00	10.00		Yes	R/W	-	-
PD D gain 3 PID[%]	791	Float	0.00	100.00	1.00		Yes	R/W	-	-
PD D filter PID [ms]	767	U16	0	1000	0		Yes	R/W	-	-
PD output PID	421	I16	-10000	+10000	0		Yes	R	-	-

The gains of the block can:
- remain fixed and set, in this case, using the **PD P gain 1 PID** and **PD D gain 1 PID** parameters,
- be changed according to speed or other variables, through the **Adap spd reg** function described in Chapter 5.13.2. In this case, the gains are from **PD P gain 1-2-3 PID** and **PD D gain 1-2-3 PID**.

For example, it is possible to dynamically modify PD block gains according to speed, a regulation parameter internal to the variable speed drive or an analog input proportional to size. This will optimise regulator behaviour.

Note: When the **Adap spd reg** function is enabled, it operates on both the PID function and the gains of the speed regulator. Therefore, it is necessary to set all relative parameters. If it is necessary to dynamically modify the gains of the speed regulator while keeping the gains of the PID function fixed, it is necessary to set the three proportional gains and derivatives of the PD block to the same value. This is also the case where PID gains must be modified and the speed regulator gains must remain fixed.

PD P gain 1 Proportional gain of PD block*

PD D gain 1 Derivative gain 1 of PD block*

PD P gain 2 Proportional gain of PD block*

PD D gain 2 Derivative gain 2 of PD block*

PD P gain 3 Proportional gain of PD block*

PD D gain 3 Derivative gain 3 of PD block*

PD D filter PID Time constant of the filter of the derivative part.

PD output PID PD block output.

*selection depends on the possible enabling of the Adap spd reg function and its configuration.

OPTIONS

5.16.3.7 Output reference

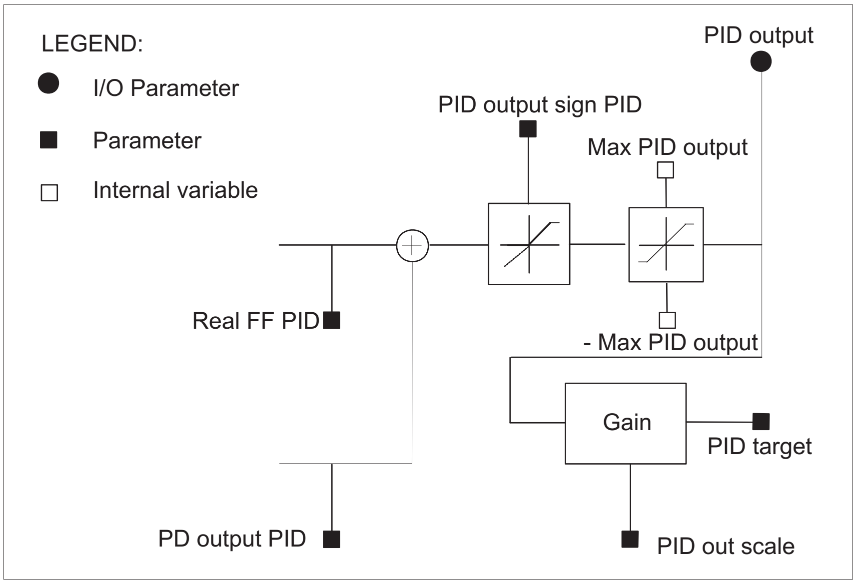


Figure 5.16.3.5: Output reference block description.

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
OPTIONS \ PID \ PD control										
PID out sign PID	772	U16	0	1	Bipolar (1)		Yes	R/W	-	-
Bipolar								1		
Positive								0		
PID output	774	I16	-10000	+10000	0	(A)	Yes	R	QA	R

(A) This parameter can be assigned to a programmable analog output.

PID out. sign PID Regulator output is bipolar or positive: 0= Positive, 1 = Bipolar.

PID output Regulator output display. It is possible to set this parameter to an analog output in order to perform a reference cascade in multiple DC drive systems.

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
OPTIONS \ PID \ PID target										
PID target	782	U16	0	65535	0		Yes	R/W	-	-
PID out scale	773	Float	-100.000	+100.000	1.000		Yes	R/W	-	-

PID target Number of the parameter to which the regulator output signal is to be sent. To obtain the correct parameter number, the value 2000H (8192 decimal) must always be added to it.

The selectable parameters are those indicated with write access (W or R/W) in Chapter 8.2 «List of high-priority parameters». The units of measurement are those indicated in the notes at the end of the chapter.

OPTIONS

PID out scale Adjustment factor of PID output. The value depends on the parameter to which regulator output is to be sent.

Example of programming of speed reference 1 (Speed ref 1 parameter) on PID target:
Menu OPTION
——> PID
——> PID target
——> PID target = 8234

For **PID target**, the number of the parameter to which it is assigned should be chosen from the list in Chapter 8.2.
Speed ref 1 has the decimal number 42. To obtain the real address, 8192 must be added:
8192 + 42 = 8234.

Note: When the ramp function is enabled, Speed ref 1 is automatically assigned to the ramp output. To ensure that Speed ref 1 is available, the Enable ramp = disable parameter must be set.

The **Speed ref 1** parameter is calculated internally by the variable speed DC drive at RPM x 4. Taking into account the fact that **PID output** generates values between -10000 and +10000, the scale output value must be set through **PID out scale**.

Calculation of **PID out scale**:

If at its maximum value = 10000, **PID output** must correspond to speed reference = 2000 RPM, it is necessary to set:
PID out scale = (2000 x 4) / 10000 = 0.8

It is possible to read the value of **Speed ref 1** in the parameter of the **INPUT VARIABLES \ Speed ref** menu.

Note: The value of **PID out scale** is defined according to the system to be controlled. For a better understanding of this topic, please see «Application examples».

OPTIONS

5.16.3.8 Initial diameter calculation function

This function allows preliminary calculation of the diameter of a winder/unwinder before starting the line. This allows increased system control by avoiding unwanted dancer deviation. The calculation is based partly on the measurement of dancer movement from its lower limit switch to its central working position, and partly on the measurement of the angular movement of the winder during the initial winding phase.

Note: The initial diameter calculation function can only be performed when the winder/unwinder is controlled by the dancer (and not by a load cell) and when speed feed-back is performed by an encoder (not by a tachogenerator).

The result of the calculation is assigned to the **PI output PID** parameter, thus representing the Feed-Forward multiplier factor, in order to obtain the motor rpm reference. Its value is inversely proportional to the winder diameter.

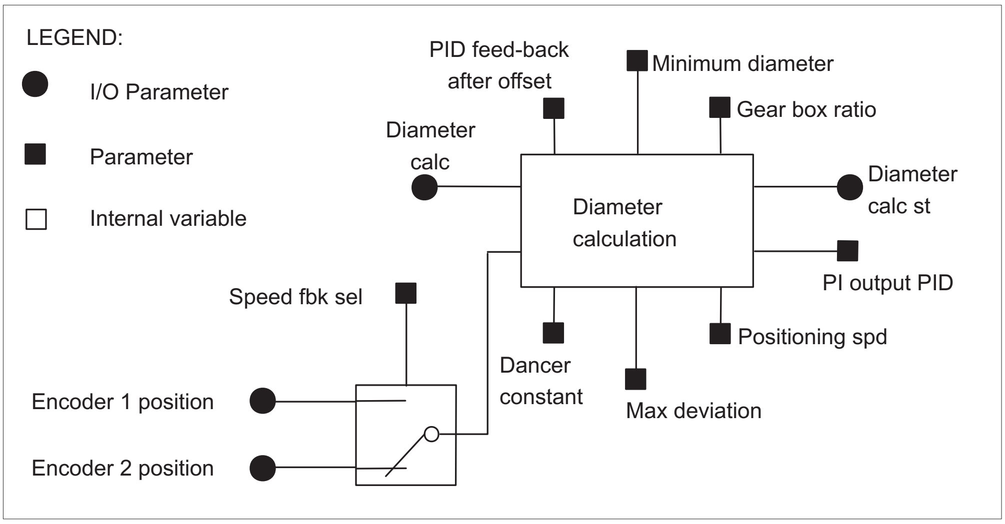


Figure 5.16.3.6: Initial diameter calculation block description.

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	RS	Term	D/P
OPTIONS \ PID \ Diameter calc										
Diameter calc	794	U16	0	1	Disabled	(E)	Yes	Z/R	ID	R/W
Enabled								1		
Disabled					0			0		
Positioning spd [rpm]	795	I16	-100	100	0		Yes	R/W	-	-
Max deviation	796	I16	-10000	+10000	8000		Yes	R/W	-	-
Gear box ratio	797	Float	0.001	1.000	1.000		Yes	R/W	-	-
Dancer constant [mm]	798	U16	1	10000	1		Yes	R/W	-	-
Minimum diameter [cm]	799	U16	1	2000	1		Yes	R/W	-	-
OPTIONS \ PID										
PI central vs0	780	U16	0	1	1	(D)	-	R/W	ID	R/W
PI central vs1	781	U16	0	1	0		-	R/W	ID	R/W
Diameter calc st	800	U16	0	1	0		-	R	QD	R

(D)This parameter can be assigned to a programmable digital output.
(E) = This parameter may be assigned to a programmable digital input.

OPTIONS

Diameter calc Enabling of the initial diameter calculating function: **Diameter calc** = enable. If **Diameter calc** has been assigned to a digital input, this must be adjusted to Status 1.

Positioning spd Motor speed at which the dancer is required to be in its central working position during the initial diameter calculation phase.

Max deviation The value of the maximum shift permitted by the dancer, expressed in A/D converter points. This value is assigned to the start of dancer movement measurement during the initial diameter calculation phase.

Note: During the preliminary phase of DC drive commissioning, it is necessary to conduct self-calibration of the analog inputs so that, regardless of the voltage of the dancer potentiometer seen through the analog input at its full-range position, it will take on the value of 10000 points. To guarantee a precise movement calculation, the **Max deviation** parameter must be set at a slightly lower value (by default, **Max deviation** = 8000).

Gear box ratio Ratio of reduction between the motor and the winder (< = 1).

Dancer constant Expresses the measurement in mm of the accumulated length of band stored.

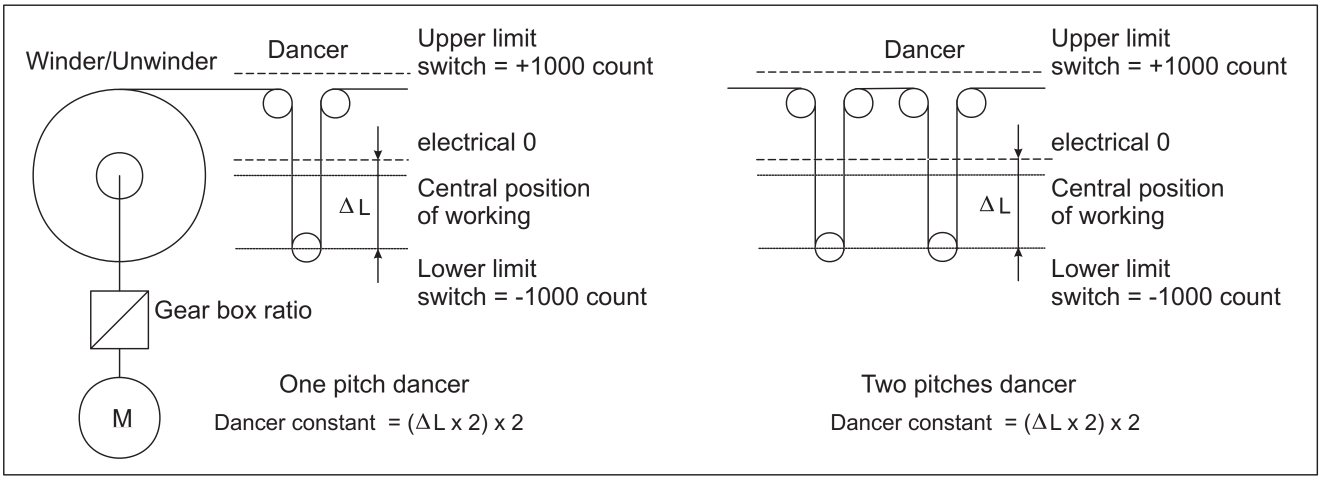


Figure 5.16.3.7: Diameter calculation.

Measurement of dancer constant:

With the dancer at its lower limit switch, carry out self-calibration of the analog input set as **PID feed-back**.
Display the **PID feed-back** parameter on the keyboard.
Measure and multiply by two the distance in mm between the lower limit switch and the position of the dancer when the **PID feed-back** parameter reaches the value 0 (electrical 0 position).
Multiply this measurement by 2 if the dancer has 2 pitches, by 4 if it has 4, and so on.

Minimum diameter Value of the minimum diameter of the winder (coil core) expressed in cm.

Diameter calc st Completed initial diameter calculation.

5.16.3.9 Initial diameter calculation procedure

The calculation is based partly on the measurement of the movement of the dancer from its lower limit switch to its central working position, and partly on the measurement of the angular movement of the winder during the initial winding phase.
Therefore, the system band immediately below the unwinder or above the winder must be blocked.
Even if the line has sections where the speed is controlled by dancers or load cells, it will first be necessary to carry out the initial phase of winder/unwinder traction alone.

The **PI central v sel** parameter must be set to 0 to avoid **PI output PID** being automatically programmed to a preset value.
The procedure is started by taking the digital input set to the **Diameter calc** parameter to Status 1 and starting up the DC Drive.
During this phase, the **Enable PI PID** and **Enable PD PID** parameters are automatically disabled.

The regulation verifies the signal from the dancer potentiometer; if this is higher than that set in Max deviation, the motor begins to turn according to the speed reference set in Positioning speed, so that the band winds on to the winder and sends the dancer to its central working position.

If the signal from the dancer potentiometer is lower than that set in **Max deviation**, the motor begins to unwind the band at the speed reference set in **Positioning speed**, taking the dancer to the point indicated by **Max deviation**. At this point, the reference is inverted in order to send the dancer back to its central working position.

In all events, the polarity of the reference assigned to **Positioning speed** (winder or unwinder) will be that of the one operating as a winder.

When the dancer reaches its central position, the **PI output PID** parameter is set to a value inversely proportional to the diameter and the **Diameter calc** parameter is brought to Status 1, signalling the end of the initial diameter calculation phase.

At this point, if **Enable PI PID** and/or **Enable PD PID** are enabled, the system is regulated automatically. Hence, the digital inputs assigned to **Diameter calc**, **Enable PI PID** and/or **Enable PD PID** can generally be enabled at the same time.

Note: The **Diameter calc st** output signal can be used to reset the **Diameter calc** command (this command is enabled on the ascending edge of the input, since the DC drive is locked) when the initial diameter calculation phase has ended.

The **PI output PID** value is calculated using the following formula:

PI output PID = (**Min diameter** x **PI top lim**) / value of calculated diameter

The **PI top limit** and **PI bottom limit** parameters of the PI controls menu will be set according to the maximum and minimum diameter of the winder. For a better understanding of this section, see 5.16.3.10 “Application examples”.

5.16.3.10 Application examples

Cross-section with dancer

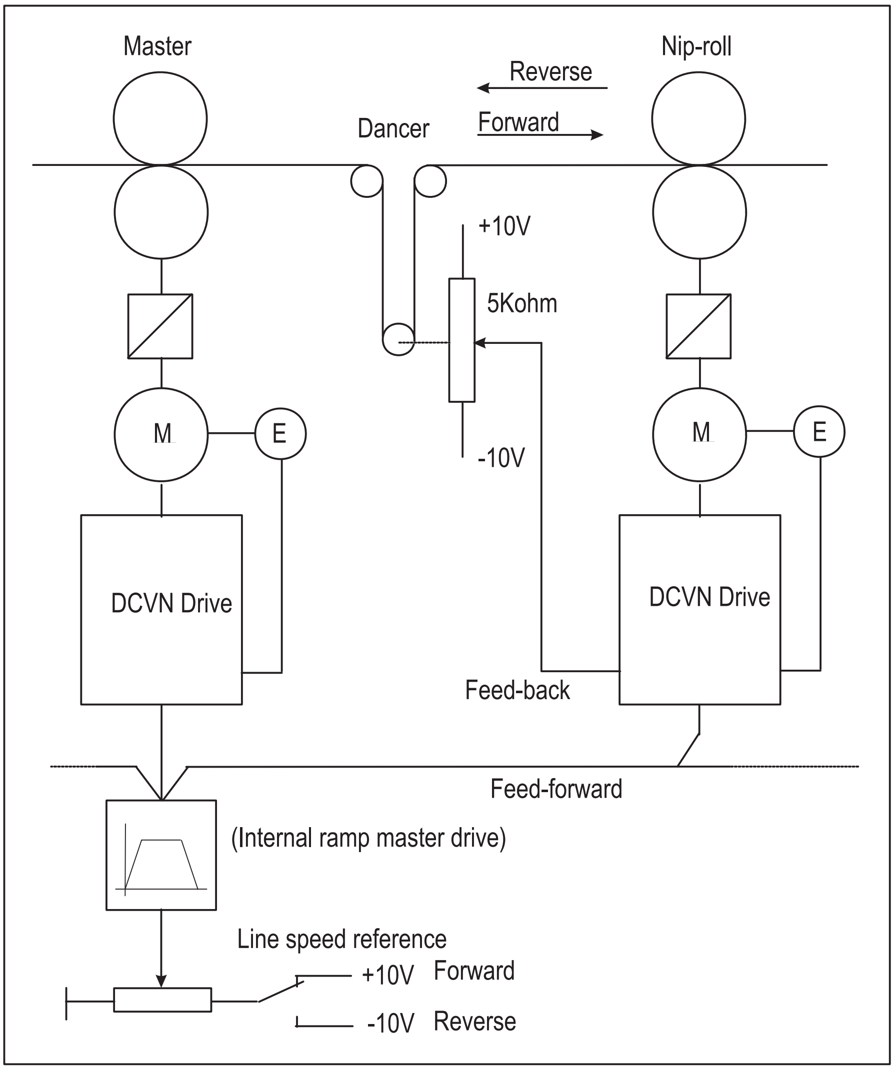


Figure 5.16.3.8: Traction control with dancer arm.

Machine data:

Rated speed of slave motor Vn = 3000 RPM
Speed of slave motor corresponding to max. line speed = 85% Vn = 2550 RPM
Maximum correction given by the dancer = +/- 15% of the line speed, which is +/- 382.5 RPM

The slave motor DC drive receives the line speed reference, the feed-back given by the dancer (-10V...+10V) and the commands enabling PID function.
The output of the regulator will be sent to speed reference 1.
DC drive settings: (only those relating to the PID function are described)

OPTIONS

Inputs/outputs

Setting of **Digital input 1** as enabling input for PI block of the PID
Digital input 1 = **Enable PI PID**

Setting of **Digital input 2** as enabling input for the PD block of the PID
Digital input 2 = **Enable PD PID**

Setting of **Analog input 1** as dancer potentiometer feed-back:
Analog input 1 / **Select input 1**= **PID Feed-back**

Setting of **Analog input 2** as line reference input to PID source:
Since it is not possible to directly assign PID source to **Analog input 2**, it is necessary to use an intermediate task word (PAD0...PAD3) ensuring that it has not already been used.

1) **Analog input 2** / **Select input 2** = PAD 0
2) Assign the PAD 0 parameter number to **PID source**, (see Chapter 8.2).
PAD 0 has the decimal number 503. To obtain the real address, 8192 must be added:
Hence,**PID source** = (8192 + 503) = 8695

Parameters

Set **Speed base value** to the rated speed of the motor.
Speed base value =3000 RPM

Set **PID source Gain** so that **Feed-fwd PID**, in accordance with the maximum analog value on **Analog input 2**, reaches 85% of its maximum value: 10000 x 0.85 =8500.

Warning: When an analog input is assigned to a word, the latter will have a maximum value of +/- 2047.
Thus,
PID source Gain = (max **Feed-fwd PID** x 85%) / max PAD 0 = (10000 x 0.85) / 2047 = 4,153

Set **PID target** as **Speed ref 1** speed reference 1.

As it is not possible to assign **PID target** directly to the **Speed ref 1** parameter, **PID target** must be assigned the parameter number corresponding to **Speed ref1** (number 42, see Chapter 8.2), to which 8192 must be added to obtain the real address:
PID source = (8192 +42) = 8234

N.B.: When the ramp function is enabled, **Speed ref 1** is automatically assigned to the ramp output.

To make **Speed ref 1** available, the **Enable ramp** parameter must be disabled.

Set **PID out scale** so that **Speed ref 1** is the same at 2550 RPM, in accordance with the maximum analog value on **Analog input 2** (**Feed-fwd PID** = 8500), and with **Enable PI PID** and **Enable PD PID** = disable.

Remember: The **Speed ref 1** parameter is calculated internally by the DC Drive at RPM x 4. Taking into account that **PID output** generates values, in this case, between -8500 and +8500, the scale output value must be set through **PID out scale**.
PID out scale = (2550 x 4) / 8500 = 1.2

5.16 Options

OPTIONS

Set **PI central v sel** = 1.
Set **PI central v 1** = 1

In the absence of correction by the PI block of the regulator, the line speed reference (Feed-Forward) must be multiplied x 1 and sent directly to the speed regulator of the DC drive.

In this application, the regulator generally carries out an exclusively proportional control. The correction will be a % of the line speed, from 0 to the maximum.

Set **PI top limit** and **PI bottom limit** so that, with a maximum dancer shift (maximum value of analog input 1 = **PID Feed-back**), and setting of the proportional gain of the PI block at 15%, it corresponds to an equal proportional correction of line speed reference.

Hence, set:
PI top limit = 10
PI bottom limit = 0.1
PI: P gain PID = 15%
PI: I gain PID = 0%

With this type of setting and a correction exclusively proportional to line speed, the PI block is not able to position the dancer, when the machine is off.
To intervene, the PD block must be enabled.

Set **PD P gain PID** to a value that will enable positioning of the dancer without too significant variations. For example:
PD P gain PID = 1%

It is possible to use the derivative part as a “damping” component of regulation, by setting, for example:
PD D gain PID = 5%
PD D filter PID = 20ms
If this is not necessary, leave these parameters at 0.

If a cascade reference is required for another DC drive, set PID output on an analog output. For example:
Analog output 1 / **Select output 1**= **PID output**
(with **Real FF PID** = 10000 points, **Analog output 1** = 10V).

OPTIONS

Cross-section with load cell

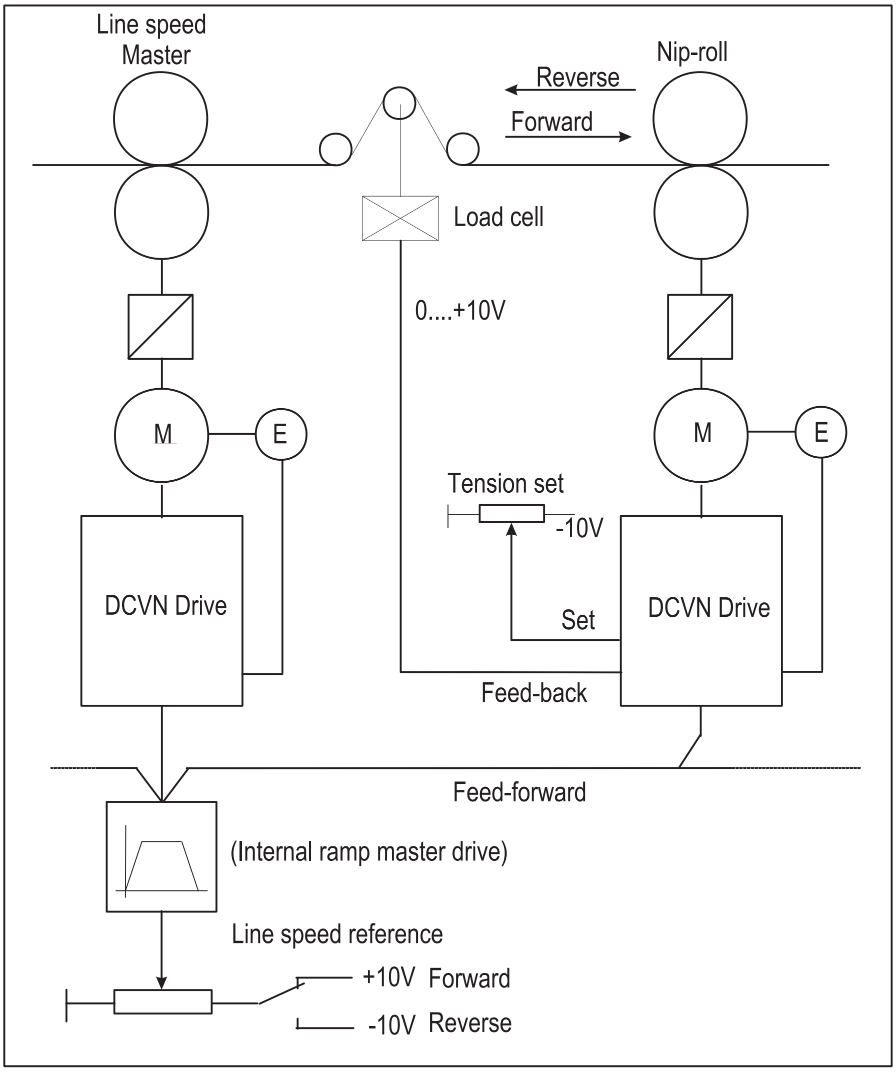


Figure 5.16.3.9: Traction control with load cell.

Machine data:

Rated speed of slave motor Vn = 3000 RPM
Speed of slave motor corresponding to max. line speed = 85% Vn = 2550 RPM
Maximum correction of load cell = +/- 20% line speed: +/- 510 RPM.

The slave motor DC drive receives the line speed reference, the feed-back given by the load (-0...+10V), the torque reference (0...-10V), and the commands enabling the PID function.

The output of the regulator will be sent to speed reference 1.

DC drive settings: (only those relating to the PID function are described)

OPTIONS

Inputs/outputs

Setting of **Digital input 1** as enabling input for block PI or PID
Digital input 1 = **Enable PI PID**

Setting of **Digital input 2** as enabling input for PD block of the PID
Digital input 2 = **Enable PD PID**

Setting of **Analog input 1** as load cell feed-back:
Analog input 1 / **Select input 1**= **PID Feed-back**

Setting of **Analog input 2** as line reference input to PID source:
Since it is not possible to directly assign PID source to Analog input 2 , an intermediate task word (PAD0...PAD3) must be used, having checked that it has not already been used.

1) **Analog input 2** / **Select input 2** = PAD 0
2) Assign the PAD 0 parameter number to **PID source**, (see Chapter 8.2).
PAD 0 has the decimal number 503. To obtain the real address, 8192 must be added:
Hence,**PID source** = (8192 + 503) = 8695

Setting of **Analog input 3** as a torque reference (PID offset 0):
Analog input 3 / **Select input 3** / **PID offset 0**

Parameters

Set **Speed base value** to the rated speed of the motor.
Speed base value =3000 RPM

Set **PID source Gain** so that **Feed-fwd PID**, in accordance with the maximum analog value on **Analog input 2**, reaches 85% of its maximum value: 10000 x 0.85 =8500.

Warning: When an analog input is assigned to a word, the latter will have a maximum value of +/- 2047.
Hence,
PID source Gain = (max **Feed-fwd PID** x 85%) / max PAD 0 = (10000 x 0.85) / 2047 = 4,153

Set **PID target** as **Speed ref 1** speed reference 1.
As it is not possible to assign **PID target** directly to the **Speed ref 1** parameter, **PID target** must be assigned the parameter number corresponding to **Speed ref1** (number 42, see Chapter 8.2), to which 8192 must be added to obtain the real address:
PID source = (8192 +42) = 8234

Note: When the ramp function is enabled, **Speed ref 1** is automatically assigned to the ramp output.

To make **Speed ref 1** available, the **Enable ramp** parameter must be disabled.

Set PID out scale **so that** Speed ref 1 **is the same at 2550 RPM, in accordance with the maximum analog value on** Analog input 2 **(**Feed-fwd PID **= 8500), and with** Enable PI PID **and** Enable PD PID = disable.

Remember: The **Speed ref 1** parameter is calculated internally by the DC drive at RPM x 4.
Taking into account that **PID output** generates values, in this case, between -8500 and +8500, it is necessary to set the scale output value through **PID out scale**.

PID out scale = (2550 x 4) / 8500 = 1.2

OPTIONS

Set **PI central v sel** = 1.
Set **PI central v 1** = 1

In the absence of correction by the PI block of the regulator, the line speed reference (Feed-Forward) must be multiplied x 1 and sent directly to the speed regulator of the DC drive.

With this application, the regulator generally carries out an exclusively proportional-integral control.
The correction will be a % of the line speed, from 0 to the maximum.

Set **PI top limit** and **PI bottom limit** to obtain a maximum PI block correction equal to 20% of the line speed.

The **PI top limit** and **PI bottom limit** parameters can be regarded as the maximum and minimum multiplier factors, respectively, of the line reference (Feed-Forward).

At the maximum line speed, it corresponds to 2550 RPM of the motor (max. Feed-Forward).
Maximum correction = 2550 x 20% = 510 RPM

2550 + 510 = 3060 RPM —> PI top limit = 3060 / 2550 = 1.2

2550 - 510 = 2040 RPM —> PI bottom limit = 2040 / 2550 = 0.80

which corresponds to multiplying the setting of PI central v 1 (= 1) by + 20% (1.2) and - 20% (0.80).

With this type of setting and a correction exclusively proportional to line speed, the PI block is not able to generate traction, when the machine is switched off.
To intervene, the PD block must be enabled.

The gains of the different regulators must be set with a loaded machine. Nonetheless, it is possible to begin tests with the following values (default values):

PI: P gain PID = 10%
PI: I gain PID = 10%
PD: P gain PID = 10%

It is possible to use the derivative part as a “damping” component of regulation, by setting, for example:

PD: D gain PID = 5%
PD: D filter PID = 20ms
If this is not necessary, leave these parameters at 0.

If a reference cascade is required for another DC drive, set PID output on an analog output. For example:
Analog output 1 / **Select output 1**= **PID output**
(with **Real FF PID** = 10000 points, **Analog output 1** = 10V).

Note: Where necessary to apply traction to the system with null error, even when the machine is switched off, please refer to Section 5.16.3.11: «Generic PID».

OPTIONS

Winder/unwinder control with dancer

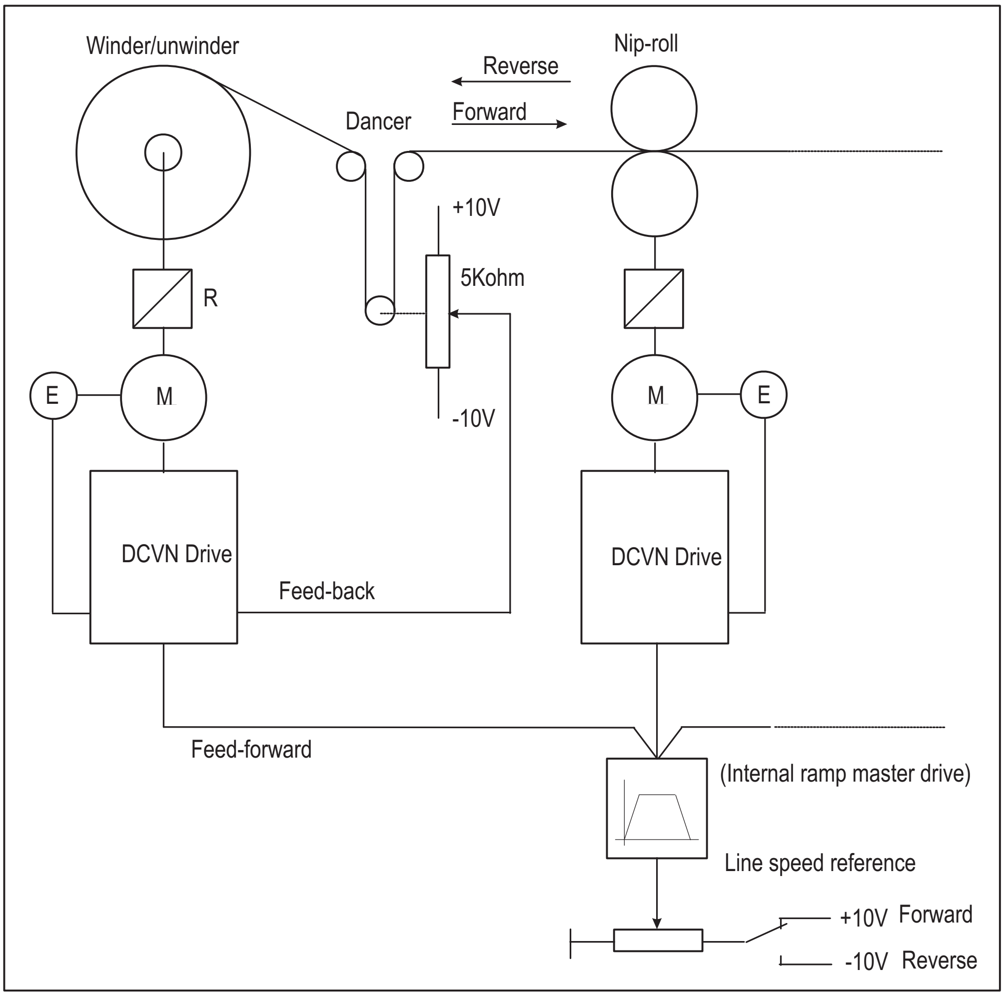


Figure 5.16.3.10: Winder/unwinder control with dancer arm

Machine data:

Maximum line speed = 400m/min
Rated speed of winder motor Vn = 3000 RPM
Maximum unwinder diameter = 700mm
Minimum unwinder diameter = 100mm
Ratio of motor-unwinder reduction= 0.5
Two-pitch dancer
Dancer shift from its lower range limit to electrical zero position = 160mm

The winder/unwinder motor DC drive receives the line speed reference, the feed-back given by the dancer potentiometer (-10V...+10V) and the commands enabling PID function.

The output of the regulator will be sent to speed reference 1.

DC drive settings: (only those relating to the PID function are described)

OPTIONS

Inputs/outputs

Setting of **Digital Input 1** as enabling input for PI block of the **PID**
Digital input 1 = **Enable PI PID**

Setting of **Digital Input 2** as enabling input for the PD block of the **PID**
Digital input 2 = **Enable PD PID**

Setting of **Digital Input 3** as enabling input for the initial diameter calculation function.
Digital input 3 = **Diameter calc**

Setting of **Digital Output 1** to signal "completed initial diameter calculation phase".
Digital output 1 = **Diameter calc st**

Setting of **Analog input 1** as dancer potentiometer feed-back:
Analog input 1 / **Select input 1**= **PID Feed-back**

Setting of **Analog input 2** as line reference input to **PID source**:
Since it is not possible to directly assign **PID source** to **Analog input 2**, an intermediate task word (PAD0...PAD3) must be used, having checked that it has not already been used.

1) **Analog input 2** / **Select input 2** = PAD 0
2) Assign the PAD 0 parameter number to **PID source**, (see Chapter 8.2).
PAD 0 has the decimal number 503. To obtain the real address, 8192 must be added:
Hence, **PID source** = (8192 + 503) = 8695

Parameters
Set **Speed base value** to the rated speed of the motor.
Speed base value = 3000 RPM

Set **PID source Gain** and **PID out scale** so that, in accordance with the maximum analog value on **Analog input 2** and in the absence of correction by the PID (**Enable PI PID** and **Enable PD PID** = disable), the peripheral speed of the winder at the minimum diameter (core) is equal to the maximum line speed.

Calculation of motor speed in these conditions:
$Vp = \pi \times \Phi min \times \omega \times R$
where,
Vp = peripheral speed of the winder = line speed
Φmin = minimum diameter of the winder [m]
ω = motor rpm
R = ratio of motor-unwinder reduction

$\omega = Vp / \pi \times \Phi min \times R = 400 / (\pi \times 0.1 \times 0.5) = 2546$ RPM, approximately 2550 RPM

While maintaining a 15% margin in the regulator saturation limit (10000 points), **PID source Gain** must be regulated so that **Feed-fwd PID**, in accordance with the maximum analog value on **Analog Input 2**, reaches 85% of its maximum value, or 10000 x 0.85 =8500

Warning: When an analog input is assigned to a word, the latter will have a maximum value of +/- 2047.
Hence,
PID source Gain = (max **Feed-fwd PID** x 85%) / max **PAD 0** = (10000 x 0.85) / 2047 = 4,153

Remember: The **Speed ref 1** parameter is calculated internally by the DC drive at RPM x 4. Taking into account that **PID output** generates values, in this case, between -8500 and +8500, the scale output value must be set through **PID out scale**.

PID out scale = (2550 x 4) / (10000 x 0.85) = 1.2

OPTIONS

Set **PID target** as **Speed ref 1** speed reference 1.
As it is not possible to assign **PID target** directly to the **Speed ref 1** parameter, **PID target** must be assigned the parameter number corresponding to **Speed ref1** (number 42, see Chapter 8.2), to which 8192 must be added to obtain the real address:
PID target = (8192 + 42) = 8234

Note: When the ramp function is enabled, **Speed ref 1** is automatically assigned to the ramp output.

To make **Speed ref 1** available, it is necessary to disable the parameter **Enable ramp** = disable.

Set **PI central v sel** = 0.
Once these settings have been made, it is possible to carry out the initial diameter calculation procedure, which is memorised after calculation.
As described earlier, the procedure defines the theoretical multiplier factor (**PI output PID**) applied to Feed-Forward in proportion to the calculated diameter, in order to send the correct angular speed value to the DC drive.

Note: When **PI central v sel** = 0 is selected and the PI block is disabled, the DC drive memorises or automatically reloads if switched off - the last calculated **PI output PID** value.

If, however, the value must be set in such a way that an uncorrected reference is present at the PID regulator output and hence equal to Feed-Forward, it is possible to assign a digital input as the correction reset. To do so, set:

Digital input 4 = **PI central v S0**

PI central v 1 = 1.00

When the input is changed to Status 1, the value of the **PI output PID** is reset.

Set **PI top lim** and **PI bottom lim** according to the winder diameter ratio.
The **PI top lim** and **PI bottom lim** parameters can be regarded as the maximum and minimum multiplier factors, respectively, of the Feed-Forward. Taking into account that the motor rpm and hence the corresponding reference varies inversely to unwinder/winder diameter, you must set:
PI top lim = 1
PI bottom lim = Φmin / Φmax = 0.1 / 0.7 = 0.14

Explanation of these settings:
Calculation of the motor rpm:
ω max. = Vl / (π x Φmin x R) and ω min = Vl / (π x Φmax. x R)

where:
ω max. = motor rpm in minimum diameter conditions [RPM]
ω min = motor rpm in maximum diameter conditions [RPM]
Vl = line speed
Φmin = minimum diameter of the winder [m]
Φmax. = maximum diameter of the winder [m]
R = ratio of motor-unwinder reduction

Hence, ω max. / ω min = Φmax. / Φmin hence, ω min = (Φmin / Φmax) x ω max.

taking into account that the **PI top lim** and **PI bottom lim** parameters can be regarded as the maximum and minimum multiplier factors, respectively, of the Feed-Forward.
By multiplying the Feed-Forward by **PI top lim** = 1, we obtain the maximum speed reference for minimum diameter.
By multiplying the Feed-Forward by **PI bottom lim** = 0.14, we obtain the minimum speed reference for maximum diameter.

5.16 Options

OPTIONS

In this application, the regulator carries out exclusively proportional-integral control.

The gains of the different regulators must be set with a loaded machine. Nonetheless, it is possible to begin tests with the following values:
PI: P gain PID = 15%
PI: I gain PID = 8%
PD: P gain PID = 5%

It is possible to use the derivative part as a “damping” component of the system, by setting, for ezample:
PD: D gain PID = 20%
PD: D filter PID = 20ms

If a reference cascade is required for another DC drive, set **PID output** on an analog output. For example:

Analog output 1 / **Select output 1**= **PID output**
(with **Real FF PID** = 10000 points, **Analog output 1** = 10V).

5.16 Options

OPTIONS

Initial diameter calculation parameters:

This function is always necessary to control a winder or when the initial diameter is not known.

Set **Positioning spd** to the RPM value at which the dancer will be positioned initially. For example:
Positioning spd = 15 RPM

In all events, the polarity of the reference assigned to **Positioning speed** (winder or unwinder) will be that of the one operating as a winder.
If, for instance, an unwinder is used whose speed reference in normal operation is positive, assign a negative value to **Positioning spd**.

Set **Max deviation** to a slightly lower value than that corresponding to the maximum mechanical shift permitted by the dancer.
During DC drive commissioning, it is necessary to self-calibrate the analog inputs, particularly analog input 1, which will have the value of 10000 points, regardless of the traction of the dancer potentiometer at its lower range limit, as seen through the analog input. To guarantee a precise shift calculation, the Max deviation parameter should be set to a slightly lower value.
Max deviation = 8000 (default value)

Set **Gear box ratio** to equal the ratio of reduction between the motor and the winder:
Gear box ratio = 0.5

Set the **Dancer constant** parameter to the value in mm of the total accumulated length of the band stored:

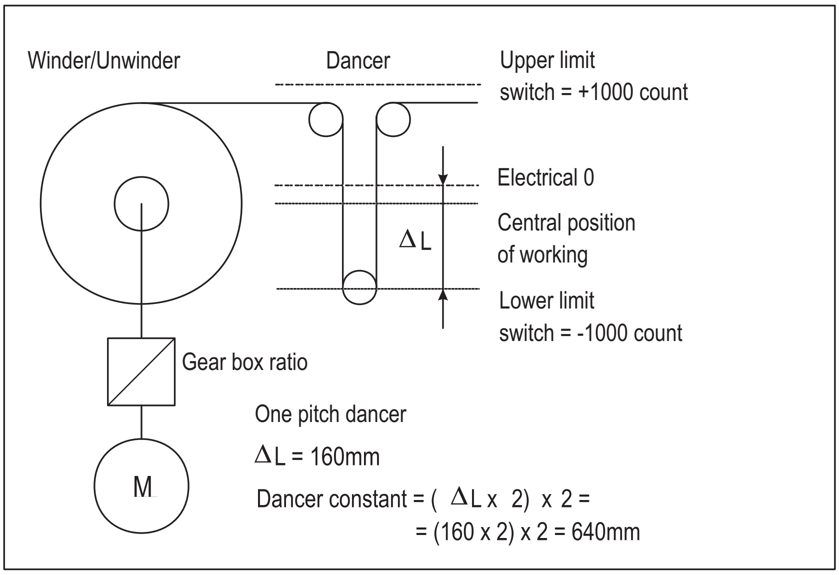


Figure 5.16.3.11: Dancer arm constant measurement.

Measurement of **Dancer constant** and setting of minimum diameter:

With the dancer at its lower limit switch, carry out self-calibration of the analog input set as **PID feed-back**.
Display the **PID feed-back** parameter on the keyboard.
Measure and multiply by two the distance in mm between the lower limit and the position of the dancer when the **PID feed-back** parameter reaches the value 0 (electrical 0 position).
Multiply this measurement by 2.

In our case, set:

Dancer constant = 640mm

Minimum diameter Value of the minimum diameter of the winder (coil core) expressed in cm. =10cm

OPTIONS

Use with diameter sensor

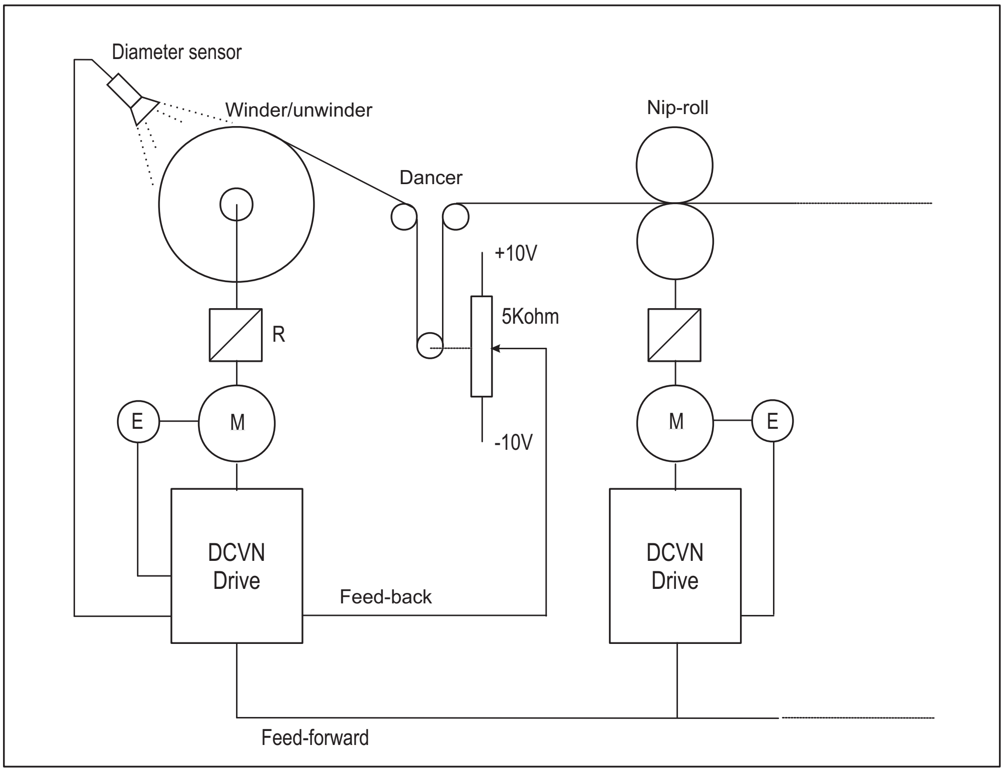


Figure 5.16.3.12: Winder/unwinder control with dancer and diameter sensor.

The diameter sensor can be used with automatic change winders.
In these cases, the initial diameter value is required to calculate the motor rpm reference, before inserting the new coil.
The transducer must be calibrated to supply a voltage signal proportional to the unwinder diameter.

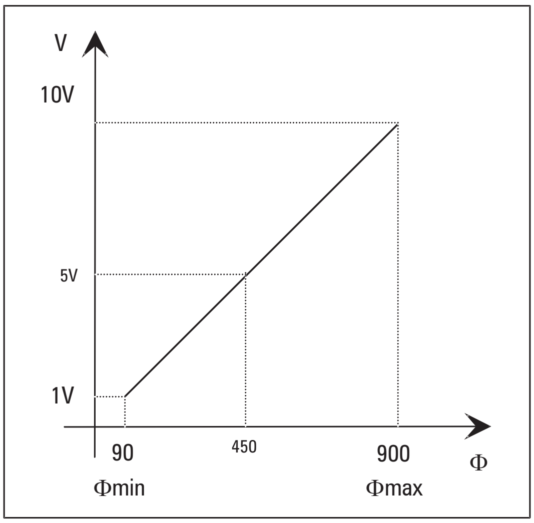


Figure 5.16.3.13: Transducer signal and unwinder signal direction.

OPTIONS

Example :	Φmin	= 90 mm	transducer output	= 1V
	Φmax	= 900 mm	transducer output	= 10V
	Φ	= 450 mm	transducer output	= 5V

The analog input connected to the sensor must be set as **PI central V3**. The **PI central v sel** parameter should be set to 3.

When **Enable PI PID** = disable, the value of **PI central V3** is indicated in **PI output PID** and used as a Feed-Forward multiplier factor.

As indicated in other parts of the manual, the setting of **PI output PID** depends on the diameters ratio. Therefore, the voltage signal proportional to the diameter will automatically be recalculated using the formula:

PI central V3 = (Φ_0 / Φ_1)

Where, Φ_0 = minimum diameter of the winder
Φ_1 = actual diameter of the winder

Result: 3 digits after the comma (even if the display does not have 2 digits after the comma).

Note: During commissioning, the signal from the sensor must be checked to ensure that it is proportional to the diameter and that its maximum value is 10V (in all events, carry out self-calibration of the analog input).

Moreover, **PI top lim** and **PI bottom lim** must be checked to ensure that they have been set according to the diameter ratio as described in the examples above.

5.16 Options

OPTIONS

Pressure control for pumps and extruders

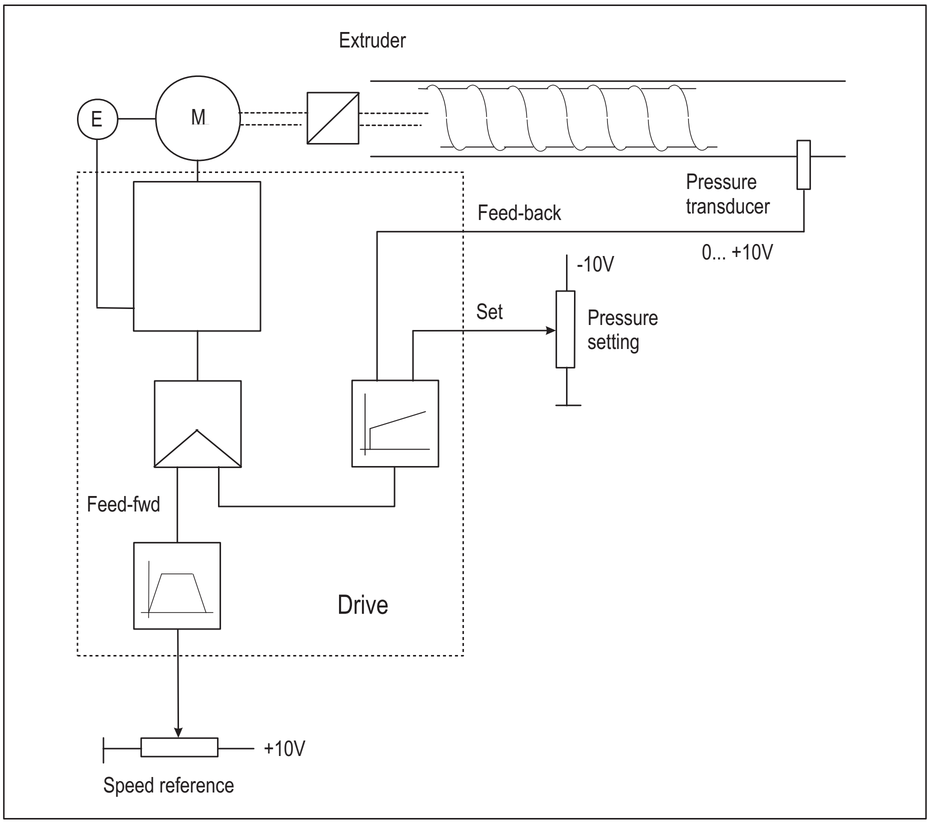


Figure 5.16.3.14: Pressure control for pumps and extruders.

Machine data:

Rated speed of extruder motor Vn = 3000 RPM
Pressure transducer 0... +10V

The extruder motor DC drive receives the speed reference, the feed-back given by the pressure transducer (0....+10V), the pressure reference (0...-10V), and the commands enabling the PID function.

The output of the regulator will be sent to speed reference 1.

DC drive settings: (only those relating to the PID function are described)

Inputs/outputs

Setting of **Digital input 1** as enabling input for PI block of the **PID**
Digital input 1 = **Enable PI PID**

Setting of **Digital input 2** as enabling input for the PD block of the **PID**
Digital input 2 = **Enable PD PID**

Setting of **Analog input 1** as feedback from the pressure transducer:
Analog input 1 / **Select input 1**= **PID Feed-back**

Setting of **Analog input 2** as speed reference input for the ramp:
Analog input 2 / **Select input 2** = **Ramp ref 1**

The ramp output must be used as a speed reference (feed-forward).

Setting of **Analog input 3** as pressure reference input (PID offset 0).
Analog input 3 / **Select input 3** / **PID offset 0**

5.16 Options

OPTIONS

Parameters

Set **Speed base value** to the rated speed of the motor.
Speed base value =3000 RPM

Set **Ramp output** to **PID source**:
Assign the number of the **Ramp output** parameter to **PID source** (see Chapter 8.2).
Ramp output has the decimal number 113. To obtain the real address, 8192 must be added:
Hence, **PID source** = (8192 + 113) = 8305

Set **PID source Gain** so that **Feed-fwd PID**, in accordance with the maximum value of **Ramp output** (corresponding to the maximum value of analog input 2), reaches 100% of its value: 10000.

The ramp reference and its output automatically take on the value declared as the Speed base value as their maximum value. It should be remembered that any parameter linked to motor speed is handled internally by the DC drive with a multiplier factor of 4 (RPM x4).

Thus,
PID source Gain = max **Feed-fwd PID** / (**Speed base value** x 4) = 10000 / (3000 x 4) = 0.833

Set **PID target** as **Speed ref 1** speed reference 1.
As it is not possible to assign **PID target** directly to the **Speed ref 1** parameter, **PID target** must be assigned the parameter number corresponding to **Speed ref1** (number 42, see Chapter 8.2), to which 8192 must be added to obtain the real address:
PID source = (8192 +42) = 8234

Note: When the ramp function is enabled, **Speed ref 1** is automatically assigned to the ramp output. To make **Speed ref 1** available, it is necessary to disable the parameter **Enable ramp** = disable.

Set **PID out scale** so that, in accordance with the maximum analog value on **Analog input 2** (**Feed-fwd PID** = 10000) and with **Enable PI PID** and **Enable PD PID** = disable, **Speed ref 1** is equal to 3000 RPM.

The **Speed ref 1** parameter is set in RPM x 4. Hence,

PID out scale = (3000 x 4) / 10000 = 1.2

Set **PI central v sel** = 1.
Set **PI central v 1** = 1

In the absence of correction by the regulator PI block, the line speed reference (Feed-Forward) must be multiplied by 1 and sent directly to the DC drive speed regulator.

Set **PI top limit** and **PI bottom limit** for maximum correction of the PI block equal to 100% of the speed reference.

The **PI top limit**and **PI bottom limit** parameters can be regarded as the maximum and minimum multiplier factors, respectively, of the Feed-Forward.

PI top limit = 1
PI bottom limit = 0

For this application, the regulator carries out an exclusively proportional-integral control.

The gains of the different regulators must be set with a loaded machine. Nonetheless, it is possible to begin tests with the following values (default values):

PI: P gain PID = 10%
PI: I gain PID = 20%
PD: P gain PID = 10%

It is possible to use the derivative part as a “damping” component of the system, by setting, for instance:
PD: D gain PID = 5%
PD: D filter PID = 20ms
If this is not necessary, leave these parameters at 0.

5.16.3.11 Generic PID

DC drive settings: (only those relating to the PID function are described)

Inputs/outputs

Setting of **Digital input 1** as enabling input for PI block of the **PID**
Digital input 1 = **Enable PI PID**

Setting of **Digital input 2** as enabling input for the PD block of the **PID**
Digital input 2 = **Enable PD PID**

Setting of **Analog input 1** as feedback of the value to be set.
Analog input 1 / **Select input 1**= **PID Feed-back**

Setting of **Analog input 2** as reference input for the value to be set (**PID offset 0**).
Analog input 2 / **Select input 2** =**PID offset 0**

Parameters

When the regulator is to be used as a "generic PID" and hence independently of Feed-Forward, the **Feed-fwd PID** parameter must be set to its maximum value. To do so, it is necessary to go through an intermediate word (PAD), making sure that it has not already been used:

Associate the number of the PAD 0 parameter to **PID source** (see Chapter 8.2).
PAD 0 has the decimal number 503. To obtain the real address, 8192 must be added:
Hence, **PID source** = (8192 + 503) = 8695

Set PAD 0 = 10000

Note: When PAD 0 = -10000, the regulator output polarity is reversed.

Set **PID source Gain** = 1

Set **PID target** with the number of the parameter to which the regulator output will be sent. To obtain the actual address, add 8192.

The parameters assignable to the regulator output are those accessible in the lists in Chapter 8.2

Set **PID out scale** according to the min. and max. scale of the parameter to which regulator output is sent (Chapter 8.2).

The speed parameters are expressed as [SPD], corresponding to the speed in RPM x 4. For all DC drive sizes, the rated current is equivalent to 2000 "current points " [CURR] (see the notes at the end of Chapter 8.2).

Thus, to set the regulator output on the scale when, for instance, it is assigned to the **T current ref 1** parameter:

PID out scale = 2000 / max. PID output = 2000 / 10000 = 0.2

Note: If the regulator output is required to be set in such a way as to allow the DC drive to supply a current 1.5 times its rated current:

PID out scale = 0.2 x 1.5 = 0.3

In this case, do not forget to enable the «**Overload contr**» overload control function by correctly setting the values for **Overload current**, **Overload time**, **Base current** and **Pause time**.

Warning! The DC drive does not check the polarity of the value sent. Therefore, if the regulator output is to be sent to unsigned parameters (indicated by the letter U in the table, it is preferable to set the PID output in such a way that it can only be positive:
PID out. sign PID = 0 (only positive output)

Set **PI central v sel** = 1.
Set **PI central v 1** = 0

With this configuration, when the PID regulator validation parameters are enabled, the regulator output starts at 0.

When it is necessary to save the last calculated value, even when the machine has been switched off, a programmed digital input must be used, such as:

Digital input xx = **PI central v S0**
PI central v 1 = 0

When the digital input is at Status 0, the last calculated value is stored in the memory.
When it is changed to Status 1, the value is reset.

Set **PI top lim** and **PI bottom lim** to obtain a correction of the PI block equal to 100% of its maximum value.
PI top lim = 1
PI bottom lim = -1

With these settings, the PI block output can be positive or negative.
By setting **PI top lim** to 0, the positive part is blocked.
By setting **PI bottom lim** to 0, the negative part is blocked.

The gains of the different regulators must be set with a loaded machine. Nonetheless, it is possible to begin tests with the following values:
PI: P gain PID = 10%
PI: I gain PID = 4%
PD: P gain PID = 10%

It is possible to use the derivative part as a “damping” component of the system, by setting, for example:
PD: D gain PID = 5%
PD: D filter PID = 20ms
If this is not necessary, leave these parameters at 0.

5.16.3.12 Dynamic modification of the integral gain of the PI block

Normally, the integral gain of the PID is set to a lower value because the ratio of the winding diameters is high. Nonetheless, while too high a value offers good adjustment of regulation with small diameters, it produces significant system instability when the winder reaches a high diameter.
Similarly, too low an integral gain value would, at a minimum diameter, result in a lack of precision in dancer position compared to its greater electric zero position as line speed increases. This is due to the fact that the loading and unloading time of the integral component is lower than diameter variation time.
In the case of high ratio diameters, it may be necessary to dynamically modify the values of the integral component of the regulator (**PI I gain PID** parameter) to the actual value of the diameter.
This is possible with the LINK (calculations) function in the Spec Functions menu.
Example allowing control of a winder whose diameters are at a ratio of 1 to 10:
The LINK 1 function will be used to connect the diameter to **PI I gain PID**.
The behaviour of **PI I gain PID** must be inversely proportional to the diameter.
Remember that the output value of **PI output PID** already follows this direction. In fact, it varies according to the Φ_0 / Φ_{act} relationship.
Where, Φ_0 = minimum diameter of the winder
Φ_{act} = current coil diameter

The operation to be performed by the LINK is:

PI output PID x KI = **PI I gain PID**

OPTIONS

Where KI corresponds to the value of the integral component of the regulator at the minimum diameter.

Let us assume that tests performed at minimum diameter and maximum speed reveal that the dancer is stable at 0 position with a **PI: I gain PID** integral gain value of 40%.

The LINK source must be assigned to **PI output PID** (parameter no. 771*):
Source link 1 = 8192 + 771 = 8963

The LINK destination must be assigned to **PI output PID** (parameter no. 764*):
Destination link 1 = 8192 +764 = 8956

* Do not forget to add 8182 to the parameter for correct assignment.

The calculation settings should be:

Mul gain link 1 = 40
Div gain link 1 = 1000*
Input max link 1 = 1000*
Input min link 1 = 100**
Input offset link 1 = 0
Output offset link 1 = 0
Input absolute link 1 = OFF

* The value 1000 is defined by PI top lim which, in this case, will be = 1 (corresponding to a maximum value of PI output PID = 1000).
** The value 100 is defined by PI bottom lim which, in this case, will be = 0.1 (corresponding to a minimum value of PI output PID = 100).

With this configuration, at minimum diameter, it will correspond to an integral gain = 40% and at maximum diameter, an integral gain = 4%. Between the two points, the gain will vary hyperbolically.

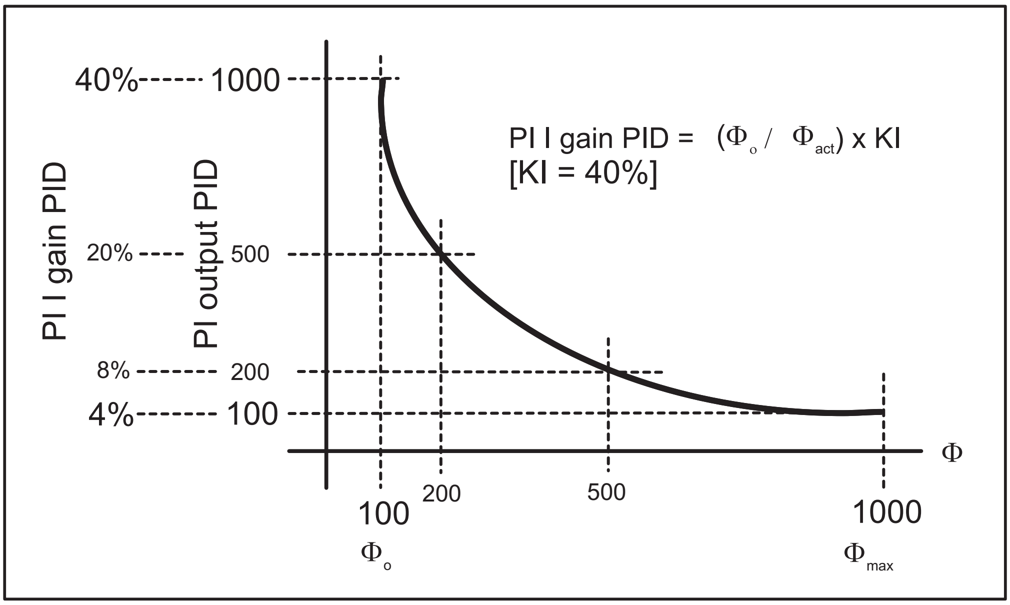


Figure 5.16.3.15: Relation between PI I Gain PID and PI I Output PID.

The value of **PI I gain PID** will be displayed in the parameter of the PI controls submenu.

Similarly, if necessary, it is possible to dynamically modify the proportional gain **PI P gain PID**, using LINK 2.

OPTIONS

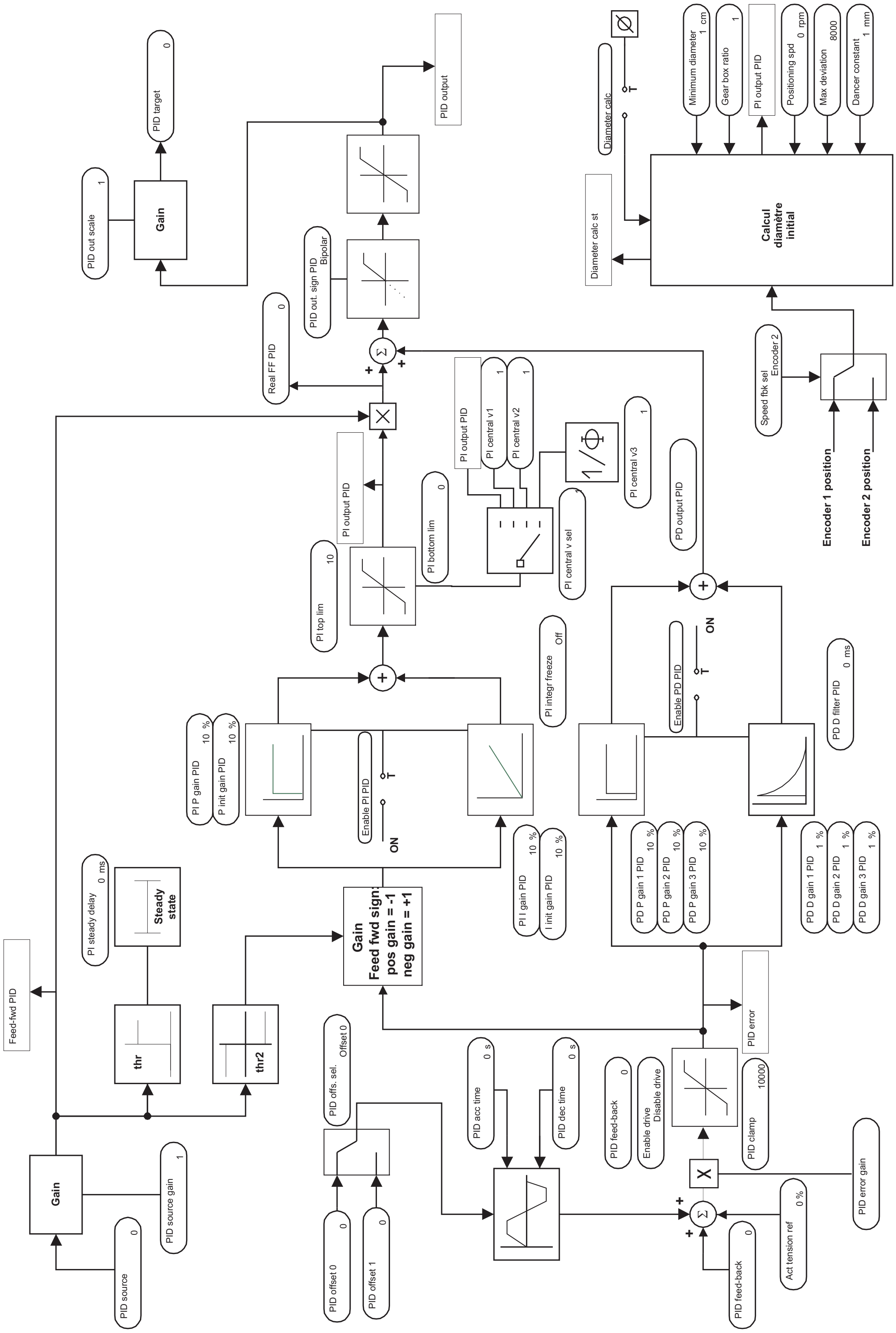


Figure 5.16.3.16 General diagram of the PID regulator.

Note:

6 - Winding/Unwinding function

The slaving function with the internal diameter to the DCVN DC Drives is used to control the winders and unwinders whose tension regulation uses an open or closed loop.
Besides the calculation functions for the torque, diameter and Taper tension compensations (reduction of tension with the diameter) the system also provides for the calculation of the speed reference for the motor. Such a function enables the drive to be used in the four regulation quadrants for controlling both the winders and the unwinders, and to control the motor with a peripheral speed proportional to the diameter in the event of a breakage in the material being wound.
The torque is also regulated according to the flux of the motor which means that this system is suitable for controlling motors working in full flux mode (area with constant torque), as in field weakening mode (area with constant power).
For closed loop regulation by strain gauge, an analogue input of 0-10 V, 0-20 mA, 4-20 mA is provided.
The output from the diameter slaving function is sent directly to the current limits; the specific parameters **T current lim +/-** and the limits fixed by the programmable overload function are always active in order to protect both the power bridge and the motor; among the three possible limits, the lowest must be used.

Input / Output

Line spd source — The value assigned to this parameter defines the assignment of the line speed. This speed is used exclusively for calculating the diameter. The speed threshold below for which the calculation is blocked **Ref speed thr**, refers to **Ref line speed**. Can be programmed as analog or encoder input.

Ref spd source — The value assigned to this parameter defines the assignment of the line reference. This is used exclusively for the following calculation:
- of inertia compensations
- of the line speed reference.

Can be programmed as analog or encoder input.

Analog inputs

Tension ref — Reference as a % of the tension; 10 V (20 mA) = 100 %.

Tension red — Reduction as a % of the Taper tension; 10 V (20 mA) = 100%.

Diam preset 3 — Adjustment of the initial diameter; 10 V (20 mA) = max diameter.

Analog outputs

Roll diameter — Actual diameter; 10 V = max diameter.

Act tension ref — Image of the tension reduced by the Taper %; 10 V = 100% **Tension ref**.

Torque current — Display of torque current; 5 V = I rated - permanent value for the DC drive.

W reference — Image of angular speed 10 V = 100 % **Base omega** (max speed programmed for the minimum radius and maximum line speed).

Actual comp — Display of active compensations (adds static and dynamic inertia friction values); 5 V = I rated - permanent value for the DC drive.

Digital inputs

Torque winder En — Activates the diameter slaving function.

Diam calc Dis — Blocking of the diameter calculation.

Diam inc/dec En — If activated and if the winder, the diameter calculated may not be decreased: if the unwinder, the diameter calculated may not be increased. Used to increase the stability of the system.

Wind/unwind — Selection of winder/unwinder:

0 = winder, 1 = unwinder.

Winder side	Selection of winding/unwinding direction: 0 = up, 1 = down.
Diam preset sel 0	LSB digital input; preselection of the initial diameter.
Diam preset sel 1	MSB digital input; preselection of the initial diameter.
Diam reset	Reset calculated diameter.
Taper Enable	Activation of taper function.
Speed match	Commands the «start» phase of the reel for automatic change.
Line acc status	Line signalling input in acceleration phase.
Line dec status	Line signalling input in deceleration phase.
Line fstp status	Line signalling input in quick deceleration phase.

These three last inputs, if entered by the control system, are used to pass from the internal line acceleration calculation.

Speed demand En	Activation of speed reference calculation.
Closed loop En	Activation of regulation in closed loop mode.

Digital outputs

Diameter reached	Signals diameter limit reached.
Spd match compl	Signals «starting» speed reached.

6.1 Diameter estimation

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
OPTIONS \ TORQUE WINDER \ Diam Calculatio										
Roll diameter [m]	1154	Float	0.000	32.000		(A)	Yes	R	QA	-
Line speed [%]	1160	Float	0.00	200.00			Yes	R	-	-
Ref line speed [%]	1286	Float	0.00	200.00			Yes	R	-	-
Diam calc Dis ON OFF	1161	U16	0	1	ON (1)	(E)	Yes	R/W 1 0	ID	R/W
Diam inc/dec En Enabled Disabled	1205	U16	0	1	Enabled (0)	(E)	Yes	R/W 1 0	ID	R/W
Wind/unwind Unwinder Winder	1187	U16	0	1	Winder (0)	(E)	Yes	R/W 1 0	ID	R/W
Minimum diameter [mm]	799	U16	1	2000	100		Yes	R/Z	-	-
Maximum diameter [m]	1153	Float	0.000	32.000	1000		Yes	R/Z	-	-
Line spd source	1204	U16	0	65535	0		Yes	R/Z	-	-
Ref spd source	1284	U16	0	65535	0		Yes	R/Z	-	-
Line speed gain	1156	I16	0	32767	0		Yes	R/W	-	-
Ref speed gain	1285	I16	0	32767	0		Yes	R/W	-	-
Base omega [rpm]	1163	U16	0	8191	1500		Yes	R/W	-	-
Ref speed thr [%]	1155	Float	0	150.00	5		Yes	R/W	-	-
Diam filter [ms]	1162	U16	0	5000	100		Yes	R/W	-	-
Diam init filter [ms]	1206	U16	0	5000	100		Yes	R/W	-	-
Diam stdy delay [ms]	1207	U16	0	60000	0		Yes	R/W	-	-
Diam reset	1157	U16	0	1	0	(E)	Yes	R/W	ID	R/W
Diam thr [%]	1158	Float	0	150.00	10		Yes	R/W	-	-
Diam reached	1159	U16	0	1		(D)	Yes	R	QD	R
Diam preset sel	1168	U16	0	3	0	(E)	Yes	R/W	ID	-
Diam preset 0 [m]	1164	Float	0.000	32.000	0		Yes	R/W	-	-
Diam preset 1 [m]	1165	Float	0.000	32.000	0		Yes	R/W	-	-
Diam preset 2 [m]	1166	Float	0.000	32.000	0		Yes	R/W	-	-
Diam preset 3 [m]	1167	Float	0.000	32.000	0	(C)	Yes	R/W	IA	-

(A) This parameter can be assigned to a programmable analog output.
(C) This parameter can be assigned to a programmable analog input.
(D)This parameter can be assigned to a programmable digital output.
(E) = This parameter may be assigned to a programmable digital input.

The diameter calculator receives the motor rpm and the line speed as inputs. The latter can be measured through an analog input from an encoder input.
The value of the diameter calculated can be assigned to an analog output; using a discrete output, it is also possible to signal that a configurable threshold has been passed.
It is possible to select four values of initial diameter one of which may come from an analog input.

Roll diameter Display of the calculated diameter expressed in [m].

Line speed Display of the line speed expressed in [%].

Diam calc Dis Disabling of the diameter calculation (see also by. **Line speed thr**). If any function is temporarily disabled during operation, the system keeps the last calculated value in memory.

6.1 Diameter estimation

Diam inc/dec En If activated and if the winder, the diameter calculated may not be decreased: if the unwinder, the diameter calculated may not be increased. Used to increase the stability of the system.

Wind/unwind Selection of winder/unwinder: Selection is made using an on-off signal: 0 V = winder, +24 V = unwinder.

Minimum diameter Value of minimum diameter expressed in [mm].

Maximum diameter Value of maximum diameter expressed in [mm].

Line spd source Line speed assignment parameter. To obtain the actual number to enter, +2000H (8192 in decimal) must be added to the value of the parameter.

Example of assignment of Encoder 1 (connector XE1) to **Line speed source:**

OPTION Menu
——> Torque winder
——> Diam calculation
——> Line speed source = 8619

Paragraph 10.4 *«List of high priority parameters»* shows that **Enc 1 speed** has the decimal value 427. To obtain the value to enter, 8192 in decimal must be added (fixed offset): 8192 + 427 = 8619.

Example of assignment of analog input 2 to **Line speed source**:

a) programming input to a PAD parameter
I/O CONFIG Menu
————> Analog input
————> Analog input 2
————> Select input 2 = PAD 0

b) adjustment of **PAD 0** as line speed input:
OPTION Menu
——> Torque winder
——> Diam calculation
————> Line speed source = 8695

Paragraph 10.4. *«List of high priority parameters»* shows that **PAD 0** has the decimal value 503. To obtain the value to enter, 8192 in decimal must be added (fixed offset):
8192 + 503 = 8695

Line speed gain Value of calibration for line speed.
This coefficient depends on the assignment parameter and gives «Line speed» = 100 % of the maximum line speed.

Line speed gain must be carried out using the formula:

[32768 x 16384 / (maximum value of assignment parameter x 8)] -1

Example of assignment of Encoder 1 (connector XE1) to **Line speed source:**

If the rotation speed of the encoder is not known, the input value to Encoder 1 can be read in the

MONITOR menu
——> Measurements
——> Speed
——> Speed in rpm
——> Enc 1 speed

Remember that the DC drive converts the speed in *RPM x 4* internally to the drive, so supposing we have at the maximum

Enc 1 speed = 1500 rpm :

Line speed gain = [32768 x 16384 / (1500 x 4 x 8) - 1] = 11184

Example of assignment of analog input 2 to **Line speed source**:

When an analog input is adjusted to a PAD parameter, its maximum value is + / - 2048, to give **Line speed** = 100 %:

Line speed gain = [32768 x 16384 / (2048 x 8) - 1] = 32767

(To obtain fine tuning, it is necessary to carry out self-tuning on the analog input).

Base omega Value in [rpm] corresponding to the maximum angular speed of the winder/unwinder (on the motor shaft).

Line speed thr Line speed threshold expressed as a %.

When **Line speed** is less than **Line speed thr**, the diameter calculation is blocked. The diameter is kept at a constant value. When **Line speed** exceeds the threshold, the diameter calculation is activated with an initial filter corresponding to **Diam init** filter for the adjusted time in **Diam stdy delay**. At the end of this time, the filter will be adjusted to **Diam filter**.

Diam filter Filter on the diameter calculation expressed in [ms].

Diam init filter Initial filter on the diameter calculation expressed in [ms].

Diam stdy delay Time in [ms] during which the value of **Diam init filter** is maintained active after **Line speed thr** has been exceeded.

Diam reset Reset to calculated diameter. When this parameter is enabled, the diameter takes a starting value selected with **Diam preset sel**.

Diam thr Programmable diameter threshold expressed as a % of **Maximum diameter**. The passing of the threshold is detected by **Diam reached** which can be sent to a discrete output.

Diam reached Signals the diameter threshold has been passed.

Diam preset sel initial diameter selector [0...3]. **Diam preset sel** can be adjusted directly using the keyboard or using the two discrete inputs configured as **Diam preset sel 0** and **Diam preset sel 1**, the selection in this case being done using binary logic.

Diam preset 0 initial diameter 0 expressed in [m]. The input value must lie between **Minimum diameter** and **Maximum diameter**.

Diam preset 1 Initial diameter 1 expressed in [m]. The input value must lie between **Minimum diameter** and **Maximum diameter**.

Diam preset 2 Initial diameter 2 expressed in [m]. The input value must lie between **Minimum diameter** and **Maximum diameter**.

Diam preset 3 Initial diameter 3 expressed in [m]. The input value must lie between **Minimum diameter** and **Maximum diameter**.

Can be assigned to an analog input. In this case 10V corresponds to **Maximum diameter** and the voltage relative to the minimum diameter will be = 10 x (**Minimum diameter** / **Maximum diameter**).

6.2 Torque calculation

The torque calculator comprises three blocks:

1. Calculation of the torque as a function of the radius of the winder/unwinder and the adjusted tension: C = T x r
2. Calculation of static, dynamic and inertia compensations
3. If the Taper function is enabled, the tension curve is calculated as a function of the radius.

The tension and Taper reduction references may be sent to an analog input, serial link or by means of the CAN open card. The calculation of angular acceleration, required for inertia compensations can be carried out using a suitable internal function or by declaring the line acceleration, deceleration and fast deceleration statuses using three digital inputs.
The link to the PID function is also part of the compensations block. Such a link is required when tension is controlled in closed loop mode with a load sensor.
The result of the calculation is sent directly to the current limits of the DC Drive and can be monitored using parameters **In use Tcur lim +** and **In use Tcur lim -** from the LIMITS menu.
The standard parameters **T current lim +/-** and the limits fixed by the programmable overload function are active in any case in order to protect both the power bridge and the motor; among the three possible values, the lowest must be used. It is also possible to define a specific current limit for the “starting” function of the reel during an automatic change.
The value of the resulting tension and that of the current corresponding to the calculated torque may be displayed on the analog outputs.

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
OPTIONS \ TORQUE WINDER \ Torque calculat										
Tension ref [%]	1180	Float	0.00	199.99	0	(C)	Yes	R/W	IA	-
Tension scale [%]	1181	I16	0	200	100		Yes	R/W	-	-
Act tension ref [%]	1194	Float	0.00	199.99			Yes	R	-	-
Torque current [%]	1193	Float	0.00	200.00		(A)	Yes	R	QA	-

(A) This parameter can be assigned to a programmable analog input.
(C) This parameter can be assigned to a programmable analog input.

Tension ref Tension reference expressed as a %.

Tension scale Current scale factor for the torque expressed as a %.

This parameter is used when the value of the maximum winding torque must be limited or in the case of regulation in closed loop mode in order to adapt the value of the current for the torque to the actual tension on the material as measured by the load sensor.
To set, please refer to paragraph *Application example.*

Act tension ref Display of the tension reference as a % reduced to % Taper, defined by means of **Tension red** ; if the Taper function is not enabled, corresponds to **Tension ref**.

Torque current Display of current required for the torque expressed as a %.

6.2 Torque calculation

6.2.1 Compensations and closure of the tension control loop

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
OPTIONS \ TORQUE WINDER \ Torque calculat \ Comp calculat										
Int acc calc En Enabled Disabled	1183	U16	0	1	Enabled (1)	(E)	Yes	R/Z 1 0	-	-
Time acc/dec min [s]	1182	Float	0.15	300.00	9.01		Yes	R/W	-	-
Acc/dec filter [ms]	1212	U16	0	5000	30		Yes	R/W	-	-
Line acc [%]	1184	Float	0.00	100.00	100		Yes	R/W	-	-
Line dec [%]	1185	Float	0.00	100.00	100		Yes	R/W	-	-
Line fast stop [%]	1186	Float	0.00	100.00	100		Yes	R/W	-	-
Line acc status	1188	U16	0	1	OFF	(E)	Yes	R/W	ID	R/W
Line dec status	1189	U16	0	1	OFF	(E)	Yes	R/W	ID	R/W
Line fstp status	1190	U16	0	1	OFF	(E)	Yes	R/W	ID	R/W
Variable J comp [%]	1171	Float	0.00	199.99	0		Yes	R/W	-	-
Constant J comp [%]	1172	Float	-100.00	+100.00	0		Yes	R/W	-	-
Act var J comp [%]	1192	Float	-	200.00	0		Yes	R	-	-
Act const J comp [%]	1191	Float	-	200.00	0		Yes	R	-	-
Mat width [%]	1173	Float	0.00	100.00	100		Yes	R/W	-	-
Static f [%]	1174	Float	0.00	199.99	0		Yes	R/W	-	-
Dinamic f [%]	1175	Float	0.00	199.99	0		Yes	R/W	-	-
Static f Zero Enabled Disabled	1287	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-
Actual comp [%]	1213	I16	-200	+200			Yes	R	QD	-
Closed loop En Enabled Disabled	1214	U16	0	1	Disabled (0)		Yes	R/Z 1 0	-	R/Z
Close loop comp	1208	I16	-32767	+32767			Yes	R	-	-

(E) = This parameter may be assigned to a programmable digital input.

Int acc calc En Enable calculation of the reel acceleration.

If enabled, this function calculates the angular acceleration internally. In this case, it is only necessary to adjust the value of **Time acc/dec min**. If it is disabled, it is necessary to fix parameters **Line acc %**, **Line dec %** , **Fast stop %** and **Time acc/dec min** and provide status information corresponding to the digital inputs.

Time acc/dec min Time expressed in [s] corresponding to the smallest time values for acceleration, deceleration and fast deceleration.

Acc/dec filter Filter expressed in [ms] on the internal acceleration calculation.

6.2 Torque calculation

Line acc % Acceleration time expressed as a % of **Time acc/dec min.**
Ex: Acceleration = line deceleration = 10 s
Fast deceleration (fast stop) = 5 s
Time acc/dec min = 5 s
Line acc % = (5 / 10) x 100 = 50 %

Line dec % Deceleration time expressed as a % of **Time Acc/dec min.**
Ex: Acceleration = line deceleration = 10 s
Deceleration (fast stop) = 5 s
Time acc/dec min = 5s
Line dec % = (5 / 10) x 100 = 50 %

Line fast stop % Fast deceleration time expressed as a % of **Time Acc/dec min.**
Ex: Acceleration = line deceleration = 10 s
Fast deceleration (fast stop) = 5 s
Time acc/dec min = 5 s
Line fast stop % = (5 / 5) x 100 = 100 %

Line acc status Signalling input: line accelerating

Line dec status Signalling input: line decelerating
Both signals are combined with outputs **Acc state** and **Dec state** (see fig. 6.2.1.1).

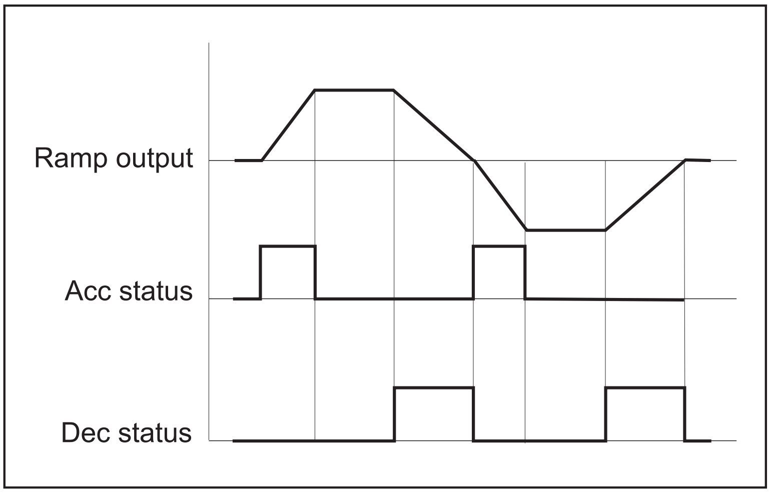


Figure 6.2.1.1: Acceleration and deceleration signalling.

Line fstp status Signalling input: line in process of fast deceleration

Variable J comp Compensation of variable inertias due to the rolled material expressed as a % of the rated current of the DC Drive. For the setting, see paragraph *Application example.*

Constant J comp Compensation of fixed inertias (motor, gearbox, chuck, shell, etc) expressed as a % of the rated current of the DC Drive. For the setting, see paragraph *Application example.*

Act const J comp	Display of the active compensation of the variable part expressed as a % of the rated current of the DC Drive.
Act var J comp	Display of the active compensation of the fixed part expressed as a % of the rated current of the DC Drive.
Mat width	Setting of the width of the rolled material expressed as a % of the maximum width.
Static f	Compensation of static frictions expressed as a % of the rated current of the DC Drive. For the setting, see paragraph *Application example.*
Dinamic f	Compensation of dynamic frictions expressed as a % of the rated current of the DC Drive. For the setting, see paragraph *Application example.*
Static f Zero	By setting the parameter to “Enabled”, the friction compensation is fully enabled for all speeds. When it is set to “Disabled”, the compensation for static frictions is fully enabled with Ref line speed = 1.5%.
Act comp	Display of active compensations (addition of static and dynamic frictions and inertia) expressed as a % of the rated current of the DC Drive.
Closed loop En	Enabling of the tension loop closure (to be used with a load sensor).
Closed loop comp	Display of the active compensation, output from the PID regulator used for closing the loop.

6.2.2 Taper function (tension reduction with diameter)

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P
OPTIONS \ TORQUE WINDER \ Torque calculat \ Taper function										
Taper enable Enabled Disabled	1176	U16	0	1	Disabled (0)	(E)	Yes	R/W 1 0	ID	R/W
Init diameter [m]	1177	Float	0.000	32.000	0.1		Yes	R/W	-	-
Final diameter [m]	1178	Float	0.000	32.000	1		Yes	R/W	-	-
Tension ref [%]	1180	Float	0.00	199.99	0	(C)	Yes	R/W	IA	-
Tension red [%]	1179	Float	0.00	199.99	0	(C)	Yes	R/W	IA	-
Act tension ref [%]	1194	Float	0.00	200.00	0	(A)	Yes	R	QA	-

(A) This parameter can be assigned to a programmable analog output.
(C) This parameter can be assigned to a programmable analog input.
(E) = This parameter may be assigned to a programmable digital input.

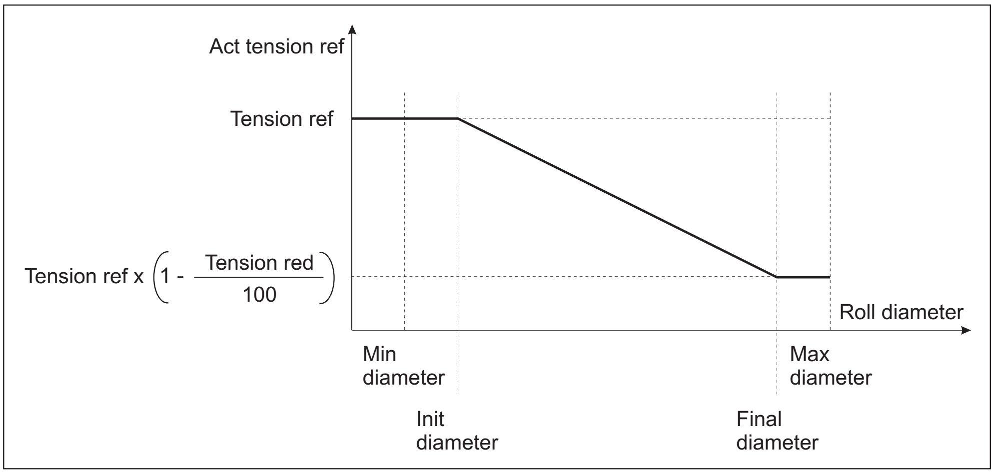


Figure 6.2.2.1: relationship between parameters of the Taper function.

Taper Enable Activation of taper function.

Init diameter Diameter for the start of the Taper tension reduction expressed in meters.

Final diameter Diameter for the end of the Taper tension reduction expressed in meters.

Tension ref Tension reference expressed as a %.

Tension red Reduction of the Taper tension expressed as a % of **Tension ref**.

Act tension ref Display of the active tension reference expressed as a % of **Tension ref.**

6.3 Estimation of speed reference

The calculation and management of the motor rpm reference allows working in four quadrants and controls the motor with a peripheral speed proportional to the diameter in the event of a breakage in the rolled material.
A program block such as this also contains management of the “starting” reference for the reel during the automatic change and tensioning phases of a stopped line.
The output from the computer may be sent to one of the four possible speed references or to an analog output.

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
OPTIONS \ TORQUE WINDER \ Speed demand										
Speed demand En	1215	U16	0	1	Disabled		Yes	R/W	-	R/W
Enabled								1		
Disabled					(0)			0		
Winder side	1201	U16	0	1	Up	(E)	Yes	R/W	ID	R/W
Down								1		
Up					(0)			0		
W gain [%]	1202	U16	0	100	0		Yes	R/W	-	-
Speed match	1195	U16	0	1	OFF	(E)	Yes	R/W	ID	R/W
ON								1		
OFF					(0)			0		
Spd match gain [%]	1200	U16	0	150	100		Yes	R/W	-	-
Spd match acc [s]	1196	Float	0.30	300.00	83.88		Yes	R/W	-	-
Spd match dec [s]	1197	Float	0.30	300.00	83.88		Yes	R/W	-	-
Spd match compl	1203	U16	0	1		(D)	Yes	R	QD	R
Spd match torque [%]	1216	U16	0	200	100		Yes	R/W	-	-
W offset [rpm]	1199	I16	0	1000	0		Yes	R/W	-	-
Offset acc time [s]	1198	Float	0.30	950.00	83.88		Yes	R/W	-	-
W target	1210	U16	0	65535	0		Yes	R/Z	-	-
W reference [rpm]	1217	I16	-8192	+8192		(A)	Yes	R	QA	-
Jog TW enable	1256	U16	0	1	Disabled	(E)	Yes	R/W	ID	R/W
Enabled								1		
Disabled					(0)			0		
Jog TW speed [%]	1255	I16	0	100	0		Yes	R/W	-	-

(A) This parameter can be assigned to a programmable analog output.
(D)This parameter can be assigned to a programmable digital output.
(E) = This parameter may be assigned to a programmable digital input.

Speed demand En Activation of speed reference calculation.

Winder side Selection of winding/unwinding direction:
0 = up, 1 = down.

W gain Adjustment of the speed reference gain used for saturating the loop. Parameter expressed as a % of the increase/decrease of the angular speed reference.

Speed match Commands the “start” phase of the reel for automatic change.

Spd match gain Adjustment of the speed reference during the starting phase, 100% corresponds to a peripheral speed equal to the line speed.

Spd match acc Acceleration time of the motor during the startup phase, in [s].

Spd match dec Deceleration time of motor in [s] if, during the startup phase a stop command is given.

Spd match compl Signalling of startup ramp completed if this is assigned to a digital output, it can be used to indicate that the reel may be changed.

Spd match torque Adjustment of the current for the torque during the startup and changeover phase. This parameter is expressed in the % of the rated drive current.

W offset Adjustment of the offset on the speed reference for tensioning the winder/unwinder when the line has stopped. This parameter is expressed in [rpm].

Offset acc time Adjustment of the material tensioning ramp when the machine has stopped. This parameter is expressed in [s]. It refers to **Speed base value.**

W target Assignment of the speed reference. To obtain the actual number to enter, +2000H (8192 in decimal) must be added to the value of the parameter where the speed reference is addressed.

1. Example of addressing on the speed 2 reference:

OPTION Menu
————> Torque winder
————> Speed demand
————> W target = 8235

Paragraph 8.2. *«List of high priority parameters»* shows that **Speed ref 2** has the decimal value 43. To obtain the number to enter, 8192 in decimal must be added (fixed offset): 8192 + 43 = 8235.

W reference Display of the speed reference.

Jog TW enable Enabling of the Jog function (pulsed running).

Jog TW speed Jog speed reference. This parameter is expressed as a % of **Line speed**

6.3 Estimation of speed reference

Management of the speed reference

To calculate the speed reference during the various operating phase of the machine, a logic state has been developed. The operational sequence of these states is shown in figure 6..3.1

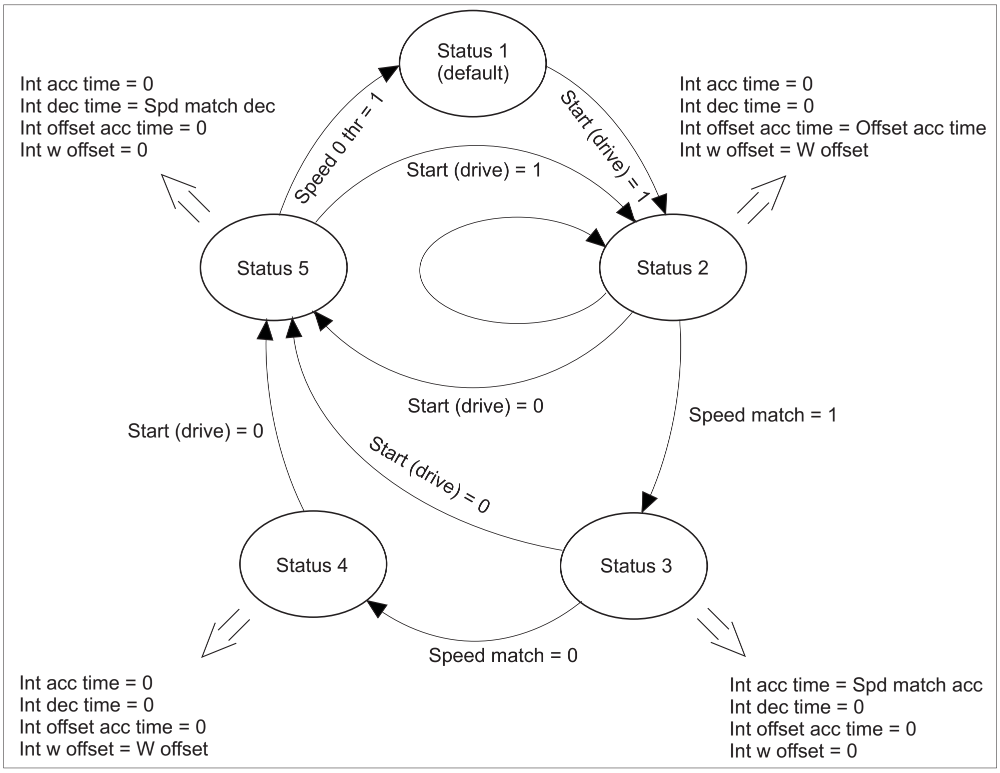


Figure 6.3.1: Operational sequence of operational status.

Status 1: Default status, the system is in this condition when the drive has stopped. The speed reference is zero.

Status 2: The system changes to this status when the Start command is given.

When the line is stopped, the tensioning reference **W offset** is assigned with the ramp time **Offset acc time.**

When the line has started, the motor speed reference follows its profile with a value of:

W reference = ± Line speed x (Minimum diameter ÷ Roll diameter) ± (W gain % + W offset)

The sign of:

± Line speed x (Minimum diameter ÷ Roll diameter)

is positive if **Wind**/**unwind** = winder

is negative if **Wind**/**unwind** = unwinder

The sign of:

± (W gain % + W offset)

is normally positive. It can only be reversed if, during the acceleration and deceleration phases, a torque inversion is requested.

The polarity of **W reference** thus calculated will later be reversed if **Winder side** = 1

(winding/unwinding from the bottom).

If during operation in status 1 the system receives a Stop (Start drive = 0) command, status 5 is imposed.

Status 3:

The system changes to this state if the command **Speed match** = 1 and the Start command are given.

Starting from the Stop condition, if these commands are given, the motor speed reference is fixed with:

W reference = [± Line speed x (Min dia ÷ Roll dia) ± (W gain % * W offset)] x Spd match gain

Where **W offset** is forced to 0 with a ramp time fixed to **Spd match acc**.

If during operation in state 3 the command **Speed match** goes to zero state 4 is imposed.

If during operation in state 3 the system receives a Stop (Start drive = 0) command, state 5 is imposed.

Status 4:

The system changes to this state if, starting from state 3, the command **Speed match** goes to zero.

Normally this happens simultaneously with the cut command and reel changeover.

In this state, the motor speed reference is fixed by:

W reference = ± Line speed x (Minimum diameter ÷ Roll diameter) ± (W gain % + W offset)

All the internal ramp times for the reference calculation are set to zero.

If during operation in state 4 the system receives a Stop (Start drive = 0) command, state 5 is imposed.

Status 5:

The system changes to this state from states 2, 3 and 4 if it receives a Stop command (Start drive = 0).

This usually follows:

a) after an automatic reel changeover to stop the reel from rotating.
   The speed reference is set to zero with the ramp time fixed by **Spd match dec**.
   The **W offset** parameter is immediately set to zero in order to slow the reel down from its current speed.
b) After the line stops, if the tensioned material on the winder/unwinder has to be removed (in this case, the DC Drive must be disabled).

In any case, when the speed goes to 0, the system changes automatically to status 1.

Status 6:

The system changes to this state when the parameter **Jog TW enable** is enabled and the Start command has been given. The jog command is used on the unwinders to lead the material from the reel up to the first intake roller. See figure 6.3.2.

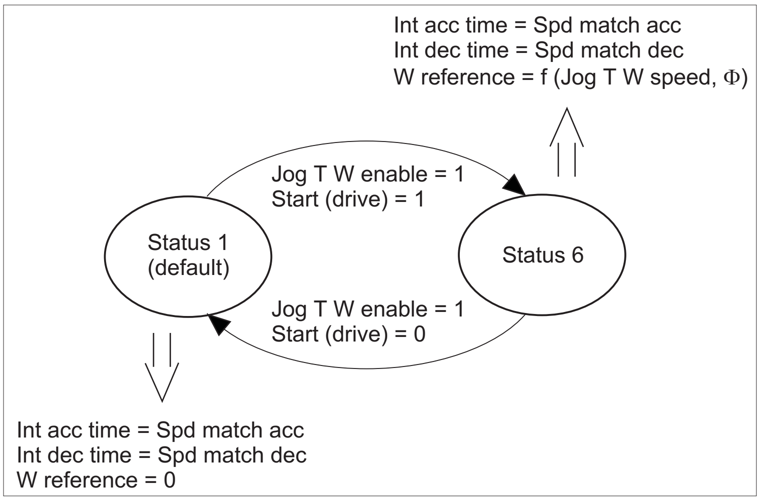


Figure 6.3.2: Operation with Jog TW enabled.

Jog TW enable prepares the system for jogs; to allow the reel to rotate, the Start command must be given, a following Stop will force the reference speed to 0 (see paragraph *Control logic*).

In state 6, the motor speed reference is fixed by:

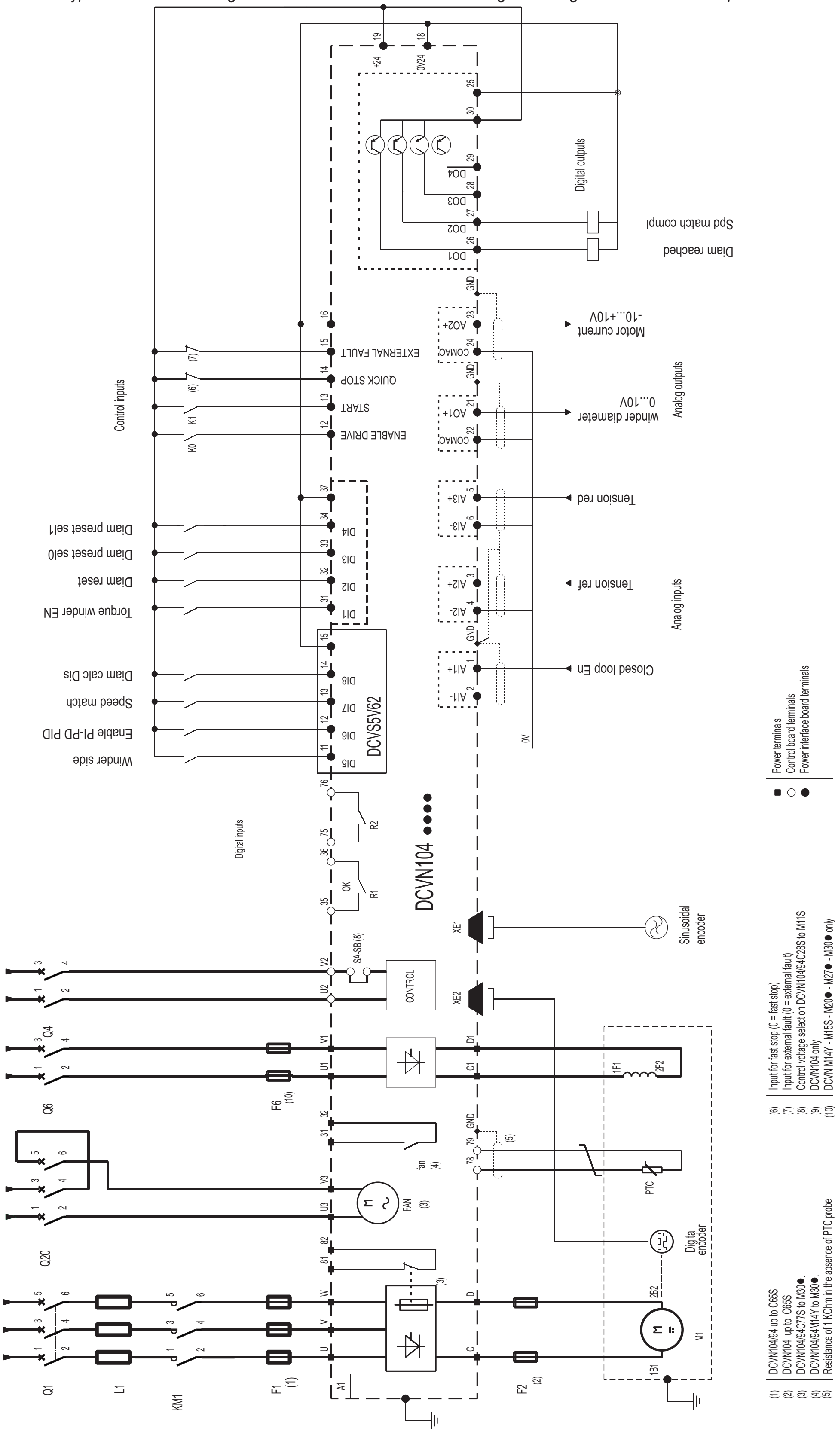
W reference = Jog TW speed x Minimum diameter ÷ Roll diameter

It is possible to change the sign of the Jog speed by using the **Winder side** command.

If when leaving state 6, **Jog TW enable** is disabled while maintaining the Start command, the system changes to status 2.

6.4 Typical winder connection diagrams

Figure 6.4.1 Typical connection diagram for winder with automatic change and regulation of closed-loop tension



6.5 Command logic

This chapter describes the most common logic sequences:
1. Diameter initialization
2. Tensioning
3. Automatic changeover
4. Stopping the reel
5. Jog function (pulsed running)

Diameter initialization

This sequence is carried out before the winder/unwinder is started either when tensioning the reel with the line stopped or in the automatic changeover phase.
The value of the diameter fixed in **Roll diameter** depends on the parameters **Diam preset 0**, **1**, **2**, **3** and **Diam preset sel**.

If 2 to 4 different initial diameter values have been set, a selection must be made using the programmed digital inputs such as **Diam preset sel 0** and **Diam preset sel 1**, or by means of parameter **Diam preset sel**.
If the initial diameter value is set using an analog input, enter **Diam preset sel** = 3.
Enable parameter **Diam reset** for a time greater than 20 ms.
Disable the state of the digital input before startup.

Tensioning

This sequence is carried out to tension the material with the line stopped.

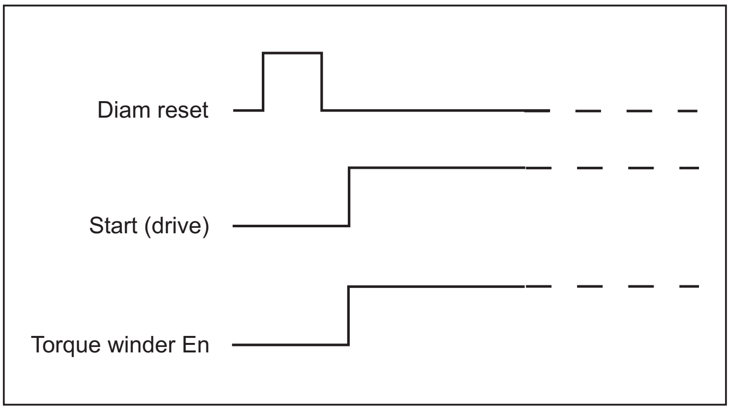


Figure 6.5.1: material tensioning with line stopped.

Initialise the value of the diameter as shown above.
Enable the tension control and give the start command to the DC Drive.
If the speed reference calculation is carried out internally to the drive (**Speed demand en** = Enable), the material will be tensioned with the reference speed set by **W offset** and with the ramp time **Offset acc time**.

Now the line can be started.

Automatic changeover

This sequence carries out an automatic changeover between two reels.

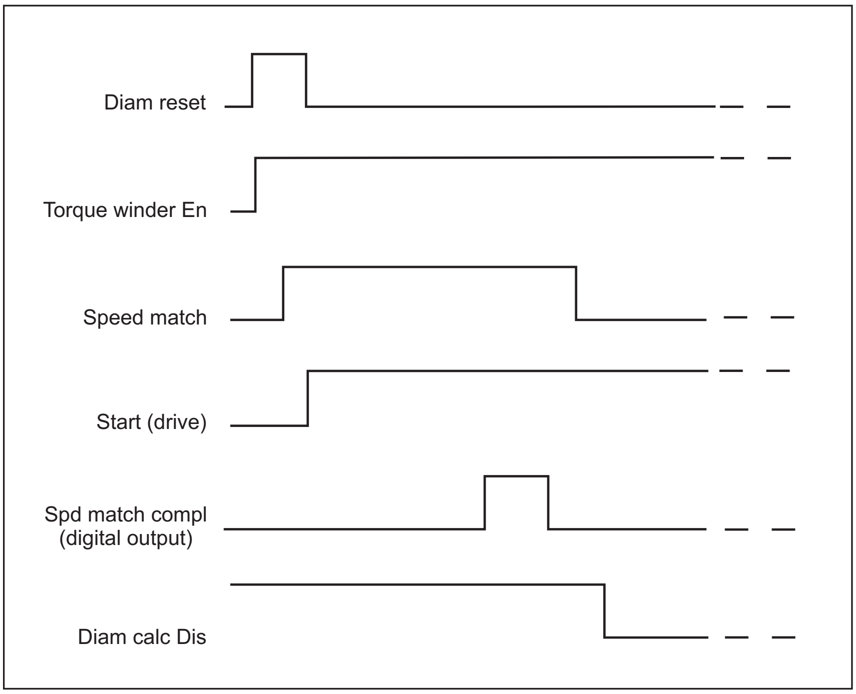


Figure 6.5.2: automatic changeover between two reels during a period of winding/unwinding.

a) Commands relating to a finished reel:
While the reel is rotating, it is advised that the calculation of the diameter of the reel while working be disabled **Diam calc dis** = 1 in order to avoid errors in the calculation of the diameter.

b) Commands relating to a new reel:
Initialise the value of the diameter as shown above.
Enable command **Speed match**, **Torque winder en** and give the start command to the drive. The motor will accelerate the reel until a peripheral speed is reached which corresponds to the line speed for **Spd match gain** with the fixed ramp **Spd match acc**. After this speed has been reached, the DC Drive signals the end of the starting phase using the parameter **Spd match compl**.
At the same time as the reel changeover, disable command **Spd match**.
Enable the diameter calculation: **Diam calc dis** = 0.

Stop the finished reel:

This sequence is used to stop the old reel after the automatic changeover has been completed.

Diameter calculation **Diam calc Dis** disabled = 1 and stop command (Start = 0). The speed of the reel reduces to zero in the period defined by **Spd match dec**.
At speed = 0 disable **Torque winder en**.

6.5 Command logic

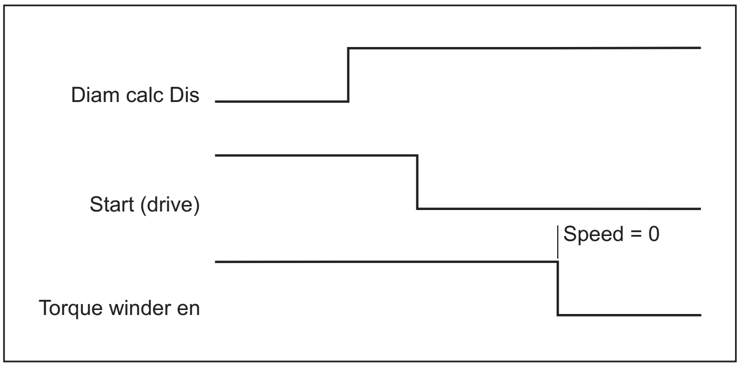


Figure 6.5.3: stopping the reel after the automatic changeover.

Jog function

The sequence is used, for example, on the unwinders in the initialisation phase, leading the material from the reel up to the first intake roller.

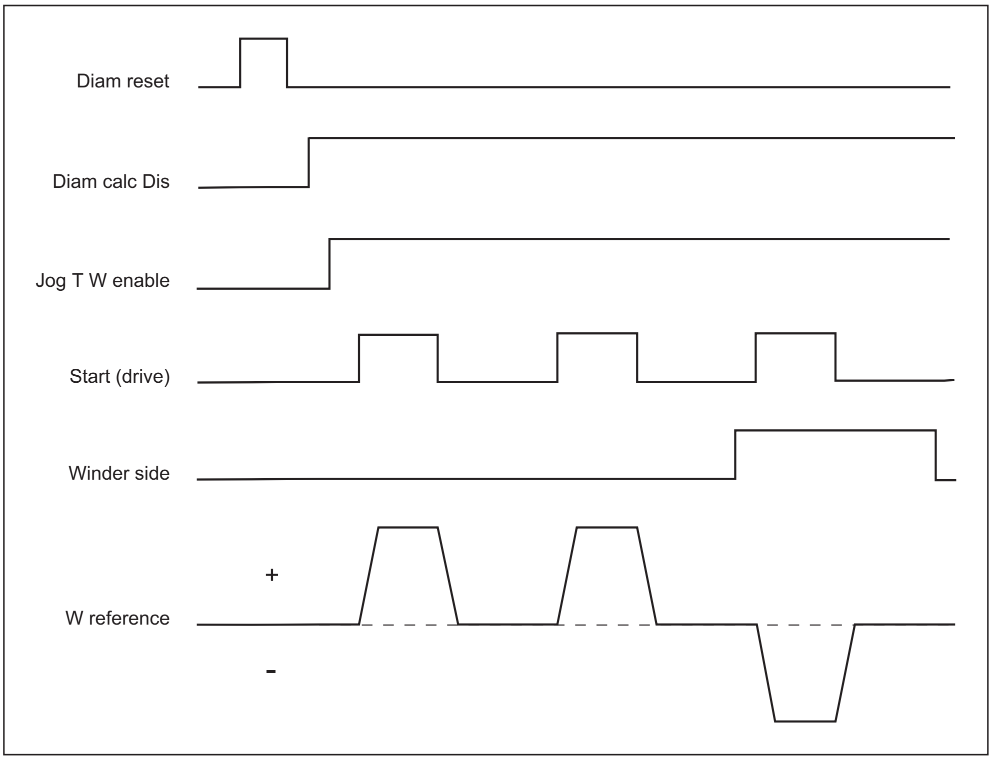
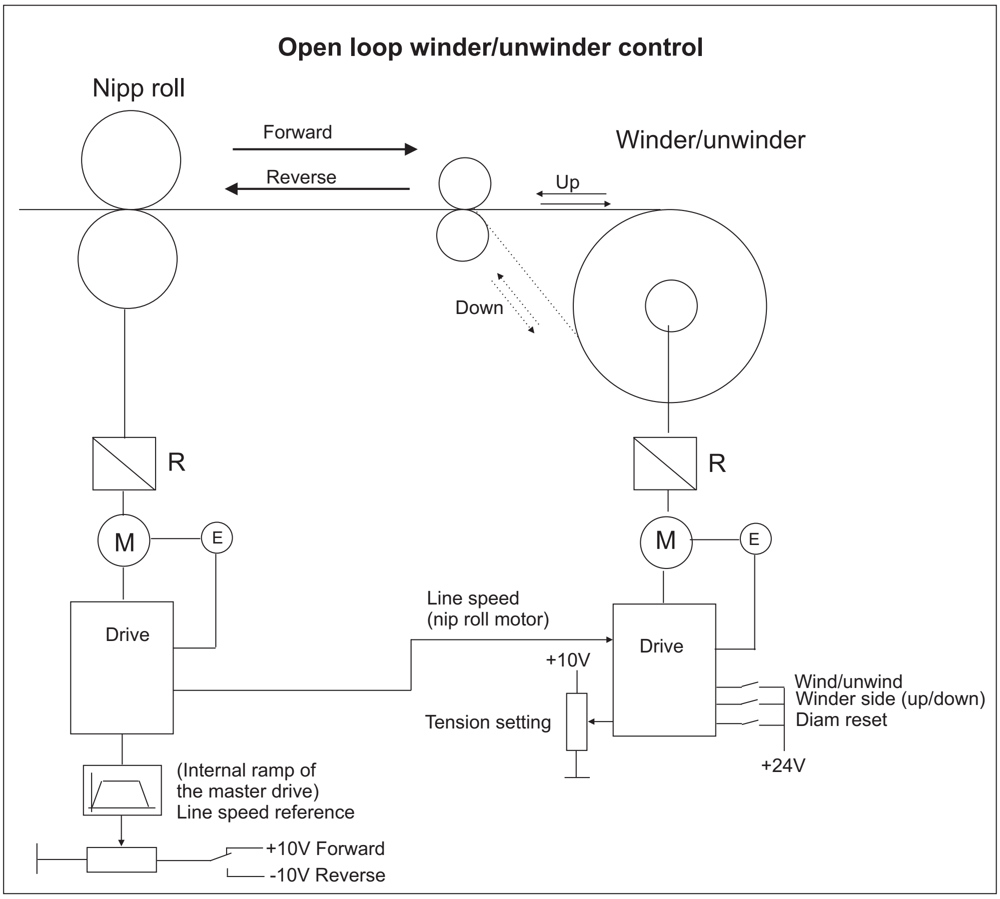


Figure 6.5.4: jog function to prepare the machine.

Initialise the value of the diameter as shown above.
Disable the diameter calculation.
Enable **Jog TW enable.**
Use the Start/Stop command to run the machine in pulses.
With the Start command, the motor accelerates the speed of the reel until the peripheral speed set in **Jog TW speed** is reached within ramp time **Spd match acc**.
With the Stop command, the motor decelerates to 0 speed in ramp time **Spd match dec**.
To reverse the direction of rotation, use command **Winder side**.

6.6 Application example



Machine features:

Maximum line speed = 400 m/min
Maximum processing speed of the winding motor, Vn=3000 rpm
Maximum winder diameter = 0.7m
Minimum winder diameter = 100 mm
Motor gearbox ratio - winder = 0.5
Speed reference of 0-10V line of the roller motor.
Acceleration/deceleration time of the line = 30 seconds
Fast stop deceleration time = 15 seconds
Winder/unwinder selection by means of a digital input.
Winder direction (up/down) selection by means of a digital input.
Tension adjustment by means of a digital input.

The winder/unwinder drive receives analog signals for the speed of the line, the set tension, digital commands for winder/unwinder selection, winding direction (up/down) and diameter readjustment.
Drive configurations and settings: (only adjustments for the Torque Winder function are described)

6.6 Application example

PROGRAMMING ANALOG INPUTS

ANALOG INPUT 1

Tension ref Tension reference expressed as a %; 10 V (20 mA) = 100 %

Menu I/O CONFIG
——> Analog input
——> Analog input 1
——> Select input 1 tension ref**:**

ANALOG INPUT 2 If the parameter **Line spd source** has to be adjusted on an analog input, this has to be done by passing a support parameter PAD0...PAD15 as this parameter is not shown in the list of high-priority parameters.

Line spd source: 10 V (20 mA) = 100 %

Programming of analog input 2 on **PAD 0**:

Menu I/O CONFIG
——> Analog input
————> Analog input 2
——> Select input 2 = PAD 0

ANALOG INPUT 3 If the parameter **Ref spd source** has to be adjusted on an analog input, this has to be done by passing a support parameter PAD0...PAD15 as this parameter is not shown in the list of high-priority parameters.

Ref spd source: 10 V (20 mA) = 100 %

Programming of analog input 3 on **PAD 1**:

Menu I/O CONFIG
——> Analog input
————> Analog input 3
————> Select input 3 = PAD 1

PROGRAMMING DIGITAL INPUTS

DIGITAL INPUT 1

Diam calc Dis: Disabling of the diameter calculation (see also by **Line speed thr**). In the event that it has just been temporarily disabled during operation, the system keeps the last value calculated in memory. This function must be enabled only if the application requests it.

Menu I/O CONFIG
————> digital input
————> digital input 1: **Diam calc Dis**:

DIGITAL INPUT 2

Wind/unwind Selection of winder/unwinder: In the event the selection is made using a digital input: 0 V = Winder, +24 V = Unwinder

DIGITAL INPUT 3

Winder side

Selection of winding/unwinding direction: in the event the selection is made using a digital input: 0 = up, 1 = down.

DIGITAL INPUT 4

Diam reset

Diameter initialization. When this parameter is enabled, the diameter takes the value selected with **Diam preset sel**.

If 2 to 4 different initial diameter values are required, the selection must be made by means of configurable digital inputs such as: **Diam preset sel 0- Diam preset sel 0**

If the initial diameter value is set using an analog input, enter **Diam preset sel** = 3.

When controlling a winder, an initialization command has to be given each time a reel is changed by entering the value of the minimum diameter (empty winder diameter).

When controlling an unwinder, a readjustment command has to be given each time a reel is changed by entering the value of the maximum diameter (maximum winder diameter).

Enable parameter **Diam reset** by a pulse greater than 20 ms.

Reset the digital input before starting.

DIGITAL INPUT 5

Diam preset sel 0

DIGITAL INPUT 6

Diam preset sel 1

Where a system controls only a winder or only an unwinder, it is possible to set the initial diameter value in **Diam preset 0**; for the winder, the minimum diameter, for the unwinder; the maximum diameter. Enter **Diam preset sel = 0** (do not program any digital input as diam preset sel 0 - diam preset 1). When command **Diam reset** is enabled, the value in diam preset 0 is copied into **Roll diameter**.

Menu OPTION

———> Torque winder

Torque winder En; program **Enable** to activate the diameter slaving function.

If the system requests it, this function can also be programmed (enable/disable) using a digital input.

Adjustment of parameters in the DIAMETER CALCULATION menu

PARAMETERS

OPTION Menu
————> Torque winder
————> Diam calculation

Wind/unwind Selection of winder/unwinder: Selection only to be made if the digital inputs are not programmed.

Minimum diameter Value of minimum diameter expressed in [mm]. Enter 100 mm

Maximum diameter Value of maximum diameter expressed in [mm]. Enter 0.7 m

Line spd source Assignment of the line speed. To obtain the actual number to enter, +2000H (8192 in decimal) must be added to the number of the selected assigned parameter.

Adjustment of **PAD 0** (N. 503) as line speed input:

OPTION Menu
——> Torque winder
——> Diam calculation
————> Line speed source = 8695

Line speed gain Calibration value for line speed.

Its programming depends on the parameter assigned to the line speed; it is used to obtain «Line speed» = 100% of its maximum value.

The calculation of **Line speed gain** must be carried out using the formula:

[32768 x 16384 / (maximum value of assignment parameter x 8)] -1

When an analog input is programmed using a PAD parameter, its maximum value is + / - 2048 consequently, to give **Line speed** = 100 %:

Line speed gain = [32768 x 16384 / (2048 x 8) - 1] = 32767

(To obtain fine tuning, it is necessary to carry out self-tuning on the analog input).

Ref spd source Assignment of the line speed reference. To obtain the actual number to enter, +2000H (8192 in decimal) must be added to the number of the selected parameter.

Adjustment of **PAD 0** (N. 503) as line speed input:

OPTION Menu
——> Torque winder
——> Diam calculation
————> Ref speed source = 8695

Ref speed gain Calibration value of the line speed reference. Its programming depends on the parameter assigned to the line speed reference, it is used to obtain “Line speed” = 100% of its maximum value.

The calculation of **Ref speed gain** must be carried out using the formula:

[32768 x 16384 / (maximum value of parameter assigned x 8)] -1

When an analog input is programmed using a PAD parameter, its maximum value is + / - 2048 consequently, to give

Ref Line speed = 100 %:

Ref speed gain = [32768 x 16384 / (2048 x 8) - 1] = 32767

(To obtain fine tuning, it is necessary to carry out self-tuning on the analog input).

Line speed Display of line speed as a %. After line speed source and line speed gain have been programmed, it is possible to check the setting by checking that with the line speed at its maximum, the value of the line speed parameter = 100%.

Ref line speed Display of line speed reference as a %.

Base omega Value in [rpm] corresponding to the maximum angular speed of the winder/unwinder (on the motor shaft).

Vp=π x Ømin x ω x R

where:

Vp = peripheral speed

Ømin = minimum winder diameter (mm)

ω = motor rpm

R = gearbox ratio

ω =Vp/ π x Ømin x R=400 / (3.14 x 0.1 x 0.5)=2547 rpm

Base omega = enter 2547 rpm.

Ref speed thr Line speed detection threshold expressed as a %.

When **Line speed** is less than **Line speed thr**, the diameter calculation is disabled. When **Line speed** exceeds the threshold, the diameter calculation is activated with an initial filter corresponding to **Diam init filter** for the time set in **Diam stdy delay**. At the end of this time, the filter will be adjusted to **Diam filter**.

Maximum line speed = 400 m/min.

Line speed thr = 5 % (the calculation of the diameter is automatically activated at 20 m/mn)

Adjustment of parameters in the SPEED DEMAND menu

PARAMETERS

OPTION Menu

————> Torque winder

————> Speed demand

Speed demand En Activation of speed reference calculation; enter **Enable**

Winder side Selection of winding/unwinding direction. Selection only to be made if the digital inputs are not programmed.

0 = up, 1 = down.

W gain Adjustment of the speed reference gain used for saturating the loop. Parameter expressed as a % of the increase/decrease of the angular speed reference.

W gain = 30 % (enter this initial value)

W offset Adjustment of the offset on the speed reference for tensioning the winder/unwinder when the line has stopped. This parameter is expressed in [rpm].

W offset = 50 rpm (check with the material)

Offset acc time Adjustment of the tensioning ramp when the machine has stopped. This parameter is expressed in [s]. The acc time is relative to the **Speed base value** parameter.

W target Assignment of the speed reference. To obtain the actual number to enter, +2000H (8192 in decimal) must be added to the number of the desired parameter.

W target : enter as speed reference 2:

OPTION Menu
————> Torque winder
————> Speed demand
————> W target = 8235

Paragraph 8.2. *«List of high priority parameters»* shows that **Speed ref 2** has the decimal value 43. To obtain the number to enter, 8192 in decimal must be added (fixed offset): 8192 + 43 = 8235

W reference It is possible to use this as display for the speed reference.

Adjustment of parameters in the COMP CALCULATION menu

OPTION Menu
————> Torque winder
————> torque calculation
————> Comp calculation

Static f: Compensation of static frictions expressed as a % of the rated current of the DC drive.

- Check that the parameters **Static f** and **Dinamic f** = 0.
- Enter tension ref = 0.
- The diameter calculation function is blocked (enable the programmed digital input as Dis diam calc).
- Operations to be carried out without material in the machine, without the Jog function and without line reference.
- Winder/unwinder motor stopped in current limit (In use **t curr lim+/- active** = 0).
- Gradually increase the value of **Static f**. The motor starts to run. Adjust a value such that the winder/unwinder is hardly turning (it must always stay within the current limit. The Ilim LED on the keyboard is illuminated).

Dinamic f: Compensation of dynamic frictions expressed as a % of the rated current of the drive.

- Enter the maximum reference of the line speed, check that the minimum diameter has been entered in **Roll diameter** (otherwise carry out a **Diam reset** on the minimum diameter).
- Temporarily enter the parameter **Static f** with a value of 10 to 20 %. The speed of the motor will increase until it reaches a speed of **Base omega** (the DC drive in this phase will exceed the current limit).
- When the motor reaches its maximum speed, reset parameter **Static f** to the value previously adjusted. The speed will start to reduce.

- Gradually increase parameter **Dinamic f** until the speed stops decreasing and the motor turns at a constant speed.
- Increase the speed by temporarily increasing the parameter **Static f**. Reset the parameter **Static f** to its correct value. The motor should maintain the speed it has reached.
- If not, readjust parameter **Dinamic f** and repeat the test until you attain the conditions required.

Static f Zero

By setting the parameter to “Enabled”, the friction compensation is fully enabled for all speeds. When it is set to “Disabled”, the compensation for static frictions is fully enabled with **Ref line speed** = 1.5%.

Int acc calc En

Enable calculation of the reel acceleration. If enabled, this function calculates the angular acceleration internally to the drive. In this case, it is only necessary to set the value of **Time acc/dec min**. If it is disabled, it is necessary to adjust parameters **Line acc %, Line dec % , Fast stop %** and **Time acc/dec min** and provide the digital inputs with the corresponding status information.

Time acc/dec min

Enter the time expressed in [s] corresponding to the smallest time values for acceleration, deceleration and fast deceleration.

Enter time acc/dec min =15 seconds (time given for fast deceleration).

Acc/dec filter

Filter expressed in [ms] on the acceleration calculation internal to the DC Drive.

Enter = 30 ms

Mat width

Width of the rolled material expressed as a % of the maximum width. Enter = 100 %

Constant J comp

Compensation of fixed inertias (motor, gearbox, chuck, etc) expressed as a % of the rated current of the DC Drive. Increase this value until the motor can increase its speed according to the line reference. During this phase, the DC Drive must always stay within the current limits.

- diameter calculation function disabled (activate the programmed digital input as **Dis diam calc**),
- operations to be carried out without material in the machine,
- install the empty reel (check that the parameter **Roll diameter** = min diameter). Check that the parameters **Constant J comp-Variable J comp** = 0
- Set tension (**tension ref**)=0 .
- Run and line reference to minimum.
- Vary the line reference.
- Gradually increase the value of **Constant J comp** until the winder/unwinder manages to follow the line speed reference.

Variable J comp

Compensation of variable inertias due to the rolled material expressed as a % of the rated current of the drive.

- Install a full reel (check that the parameter **Roll diameter** = max diameter).
- Follow the same setting procedure as for **Constant J comp**.

Act var J comp

Display current value of the variable inertia compensation, expressed as a % of the rated drive current.

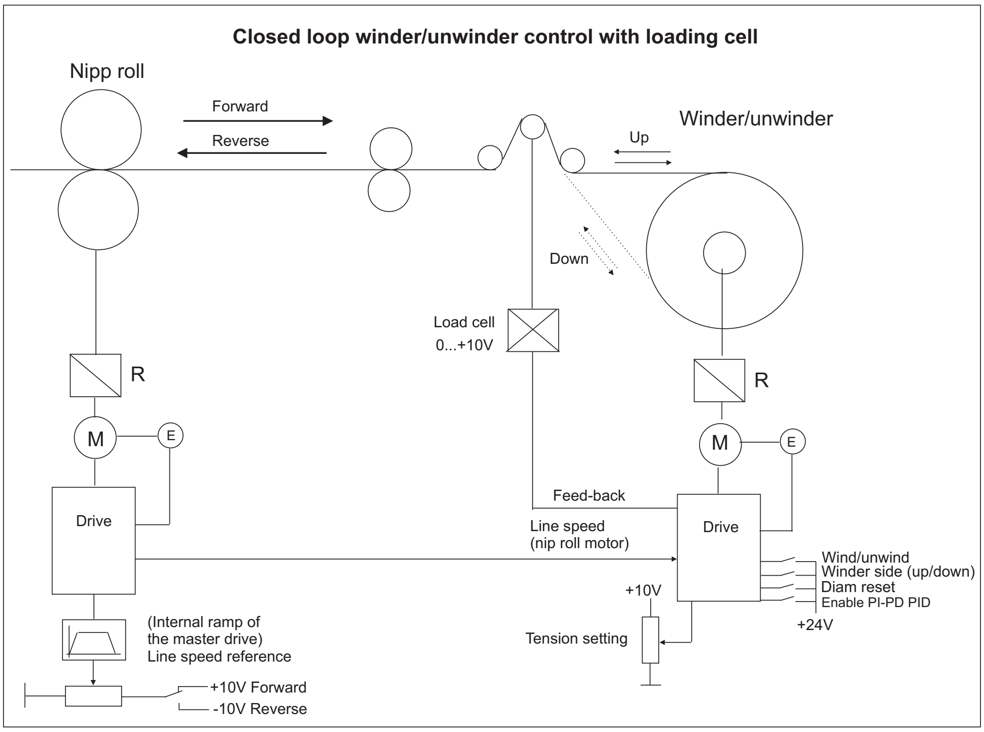
Act const J comp

Display current value of the fixed inertia compensation, expressed as a % of the rated drive current.

6.6 Application example

Act comp Display current values of compensations (addition of static and dynamic frictions and inertia forces) expressed as a % of the rated current of the DC Drive.

6.6 Application example



Machine features:

Maximum line speed = 400 m/min
Maximum processing speed of the winding motor, Vn=3000 rpm
Maximum winder diameter = 0.7m
Minimum winder diameter = 100 mm
Motor gearbox ratio - winder = 0.5
Speed reference of 0-10V line of the roller motor.
Acceleration/deceleration time of the line = 30 seconds
Fast stop deceleration time = 15 seconds
Winder/unwinder selection by means of a digital input.
Winder direction (up/down) selection by means of a digital input.
Tension adjustment by means of a analog input.

Adjust all parameters as indicated in the previous example. After having tested the machine with the material in open loop, carry out the following adjustments for setting with the load sensor.

ANALOG INPUT 3

Pid feed back Load sensor input; 10 V (20 mA) = 100 %
I/O CONFIG Menu
————> Analog input
————> Analog input 3 **Pid feed back**

Closed loop En Closure of the tension loop (to be used with a load sensor). Adjust parameter **Closed loop En** = enable

Closed loop comp Monitoring of the active compensation, output from the PID regulator used for closing the loop.

DIGITAL INPUT

Programming a digital input for activating the PID function
I/O CONFIG Menu
————> digital input
————> digital input 7 : **enable PI-PD PID**

Adjustment of Pid parameters

Program **Pid Source** as **PAD 1.**
Pid source=(8192+504)=8696
PARAMETERS
OPTION Menu
————> PID
————> Pid source
————> Pid source = 8695
Program **PAD 0** =10000
(PAD 0 is found in the “Special functions” menu)

Program **Pid source gain** =1

Program **PID target** as parameter **Closed loop comp**
The closed loop comp parameter has the decimal number 1208.
To obtain the value to insert, 8192 in decimal must be added (fixed offset).
PID target = 8192+1208 = 9400

Program **Pid out scale**
Pid out scale = (max. value of closed loop comp)/PID max output.
Pid out scale = 10000/10000 = 1
Program **PI top lim** and **Pi bottom lim** to get a correction of 100% correction of its maximum value.
PI top lim = 1
Pi bottom lim = -1
With this configuration, the output from the regulator will be positive and negative.

The gains of the various components must be defined experimentally with a loaded machine.
It is possible to start tests with the values below:
Program **PI: P gain PID** = 10 %
program **PI: I gain PID** = 4 %
program **PD: P gain PID** = 5 %
program **PD: D gain PID** = 0 %
PD: D filter PID = 20 ms

Program **PI central vsel** = 1
Set **PI central v 1** = 0
With this configuration, when the ON/OFF switch is actuated for parameters activating the PID function, the regulator output starts from 0.

Before activating the PID regulator and closing the loop, it is necessary to check the correspondence between the programmed tension and that actually measured by the load sensor.
The load sensor must be calibrated so as to present an analog output = 10V corresponding to the maximum tension required for the material.
With material in the machine, start the winder/unwinder by setting a tension of 50%.
Check the values of parameters **Act tension ref** (0... 100%, tension adjusted in the Torque winder menu) and **Pid feedback** (0... 10000, retro-action load sensor in the PID menu). These two values must be equal.

If not, adjust parameter **Tension scale** until these two parameters reach the same value.

After carrying out this configuration, it is possible to start the tests with the material.
Optimize the stability of the system using the various components of the PI and PD PID blocks.

6.6 Application example

Conventions

To simplify the commissioning procedure and make it consistent, a convention has been installed in the system concerning the speed and torque directions which should be complied with:

As a general rule, it has been agreed to consider the speed and torque directions of a winder winding from the top as positive.

All other possible system configurations shown in the examples below refer to this convention.

Note! The polarity of the line speed reference is not important as the system defines the reference polarity on output only as a function of parameters **Wind/unwind** and **Winder side**.

1. Drive actioning a winder - winding direction = from above.

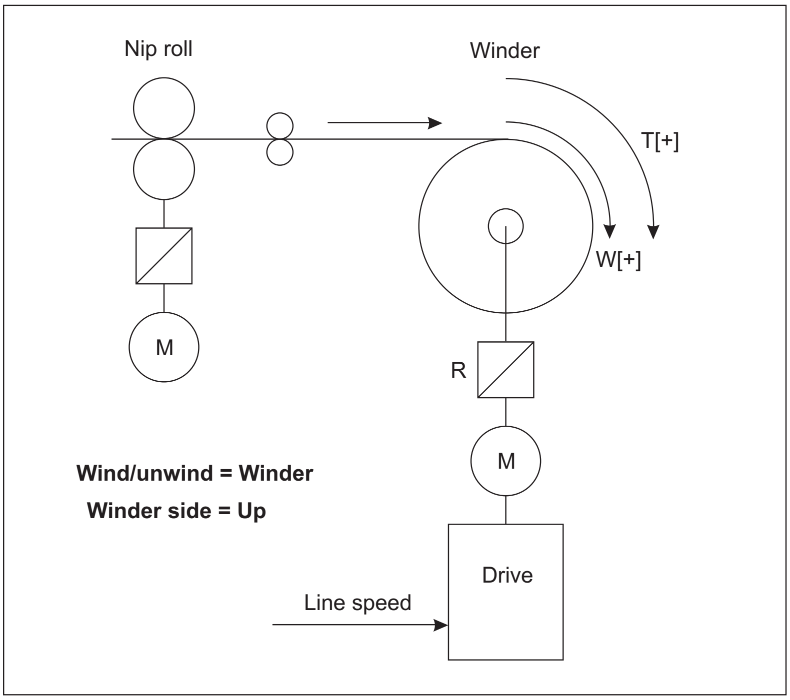


Figure 6.6.1: drive actioning a winder - winding direction = from above.

If the speed demand function is used, the system creates a positive speed reference; it is therefore necessary to connect the motor such that with this polarity, the reel winds the material from the top. The winding torque is positive.

2. Drive actioning a winder - winding direction = from below.

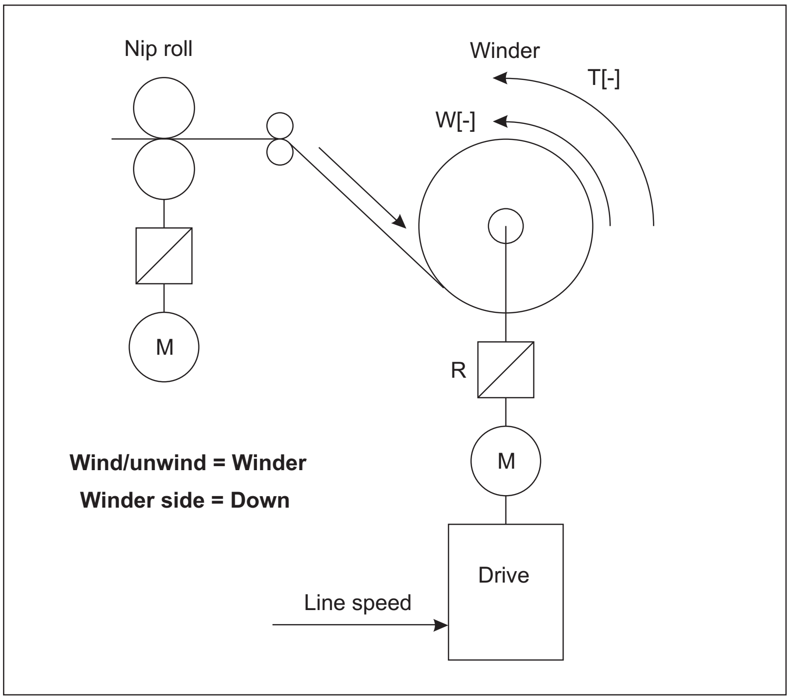


Figure 6.6.2: drive actioning a winder - winding direction = from below.

If the speed demand function is used, the system creates a negative speed reference; it is therefore necessary to connect the motor such that with this polarity, the reel winds the material from the bottom. The winding torque is negative.

3. Drive actioning an unwinder - unwinding direction = from above

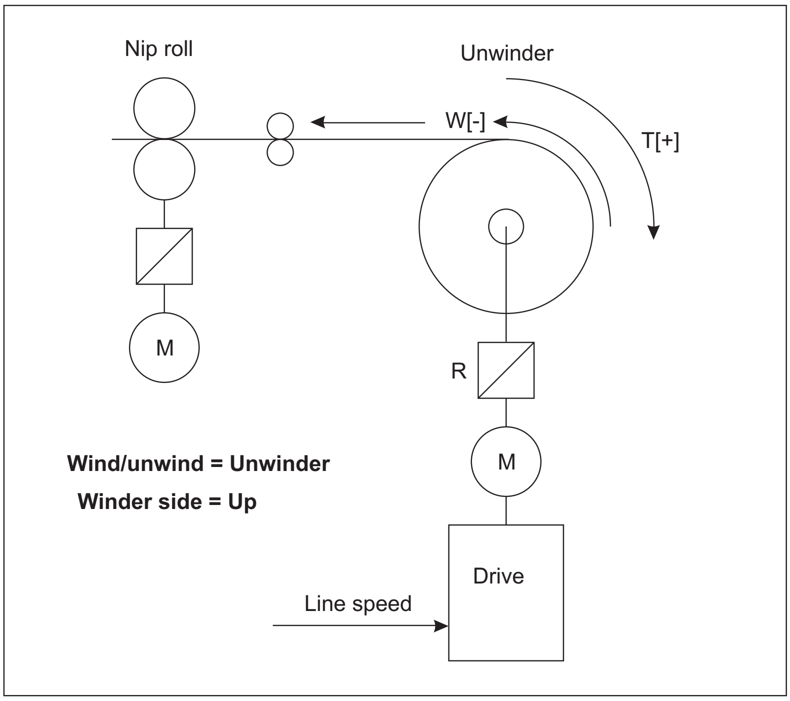


Figure 6.6.3: drive actioning an unwinder - unwinding direction = from above.

6.6 Application example

If the speed demand function is used, the system creates a negative speed reference; it is therefore necessary to connect the motor such that with this polarity, the reel unwinds the material from the top. The unwinding torque is positive.

4. Drive actioning an unwinder - unwinding direction = from below

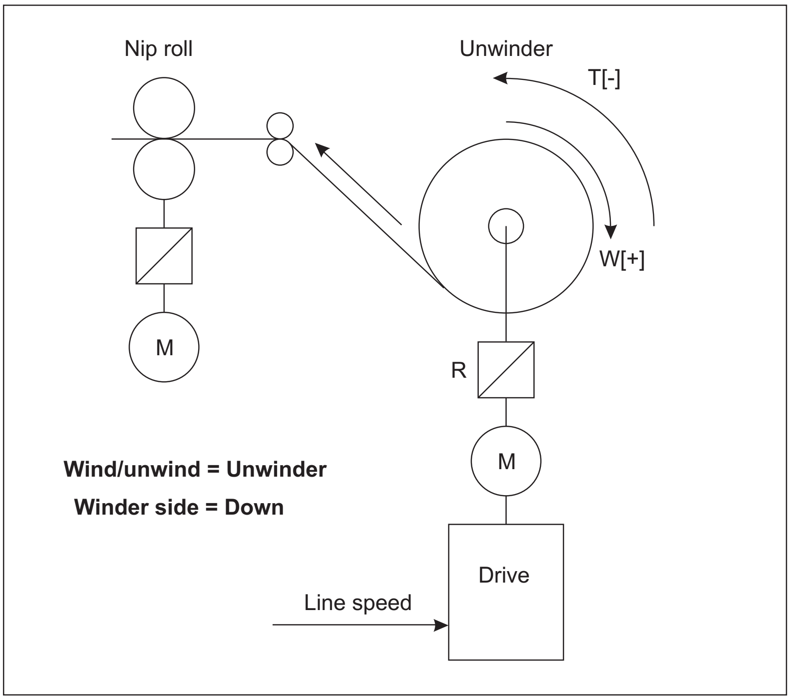
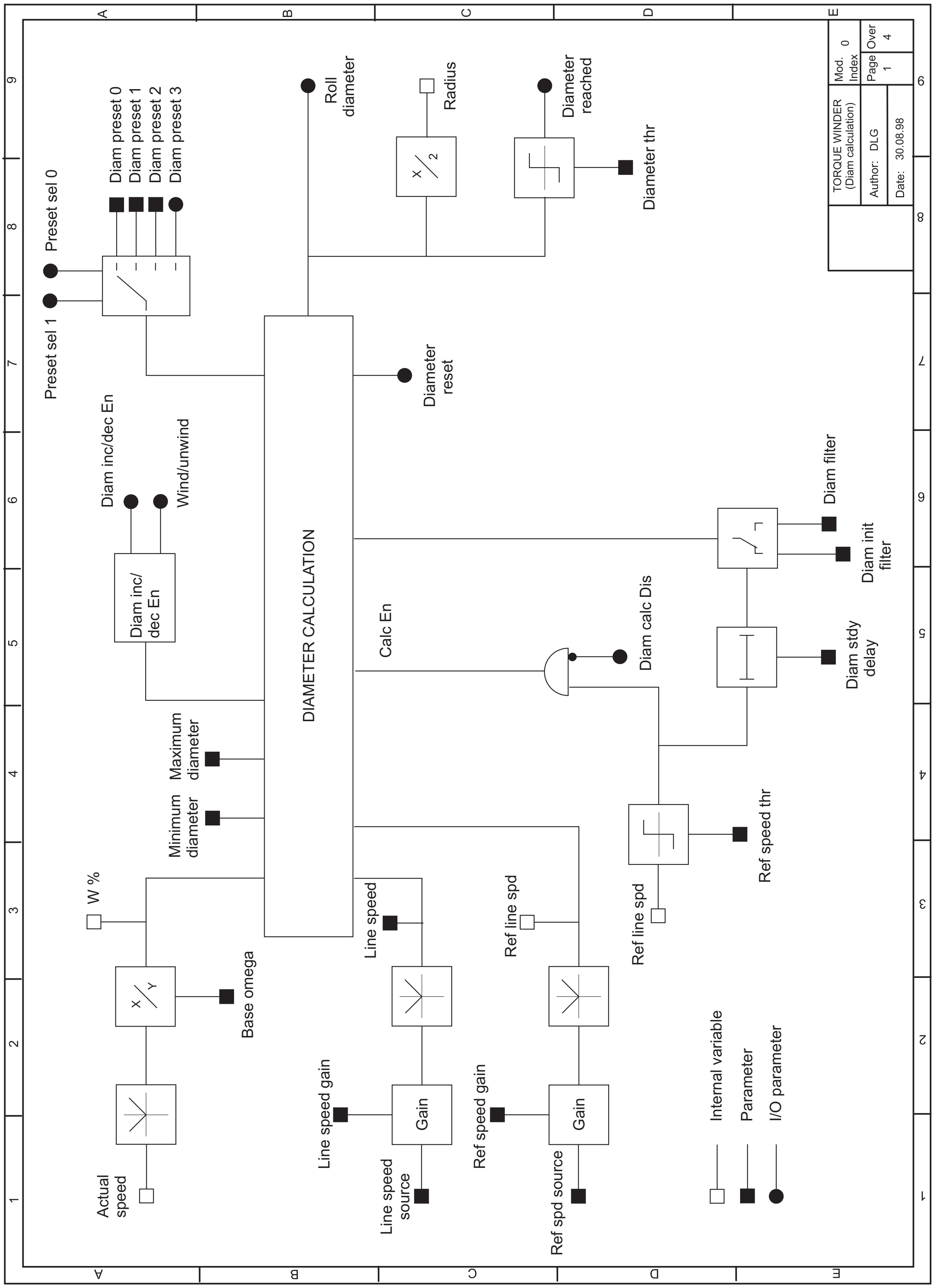


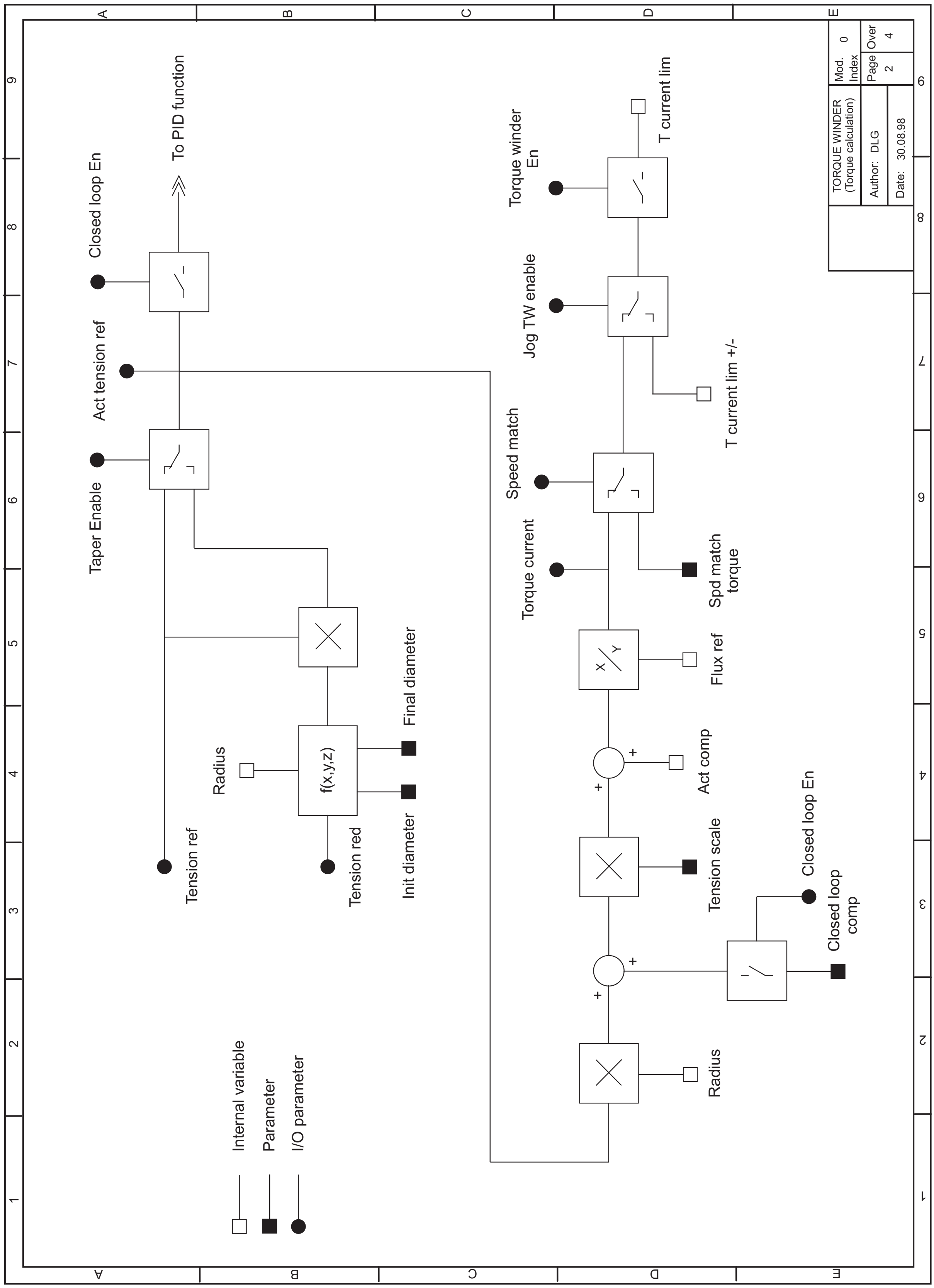
Figure 6.6.4: drive actioning an unwinder - unwinding direction = from below.

If the speed demand function is used, the system creates a positive speed reference; it is therefore necessary to connect the motor such that with this polarity, the reel winds the material from the bottom. The unwinding torque is negative.

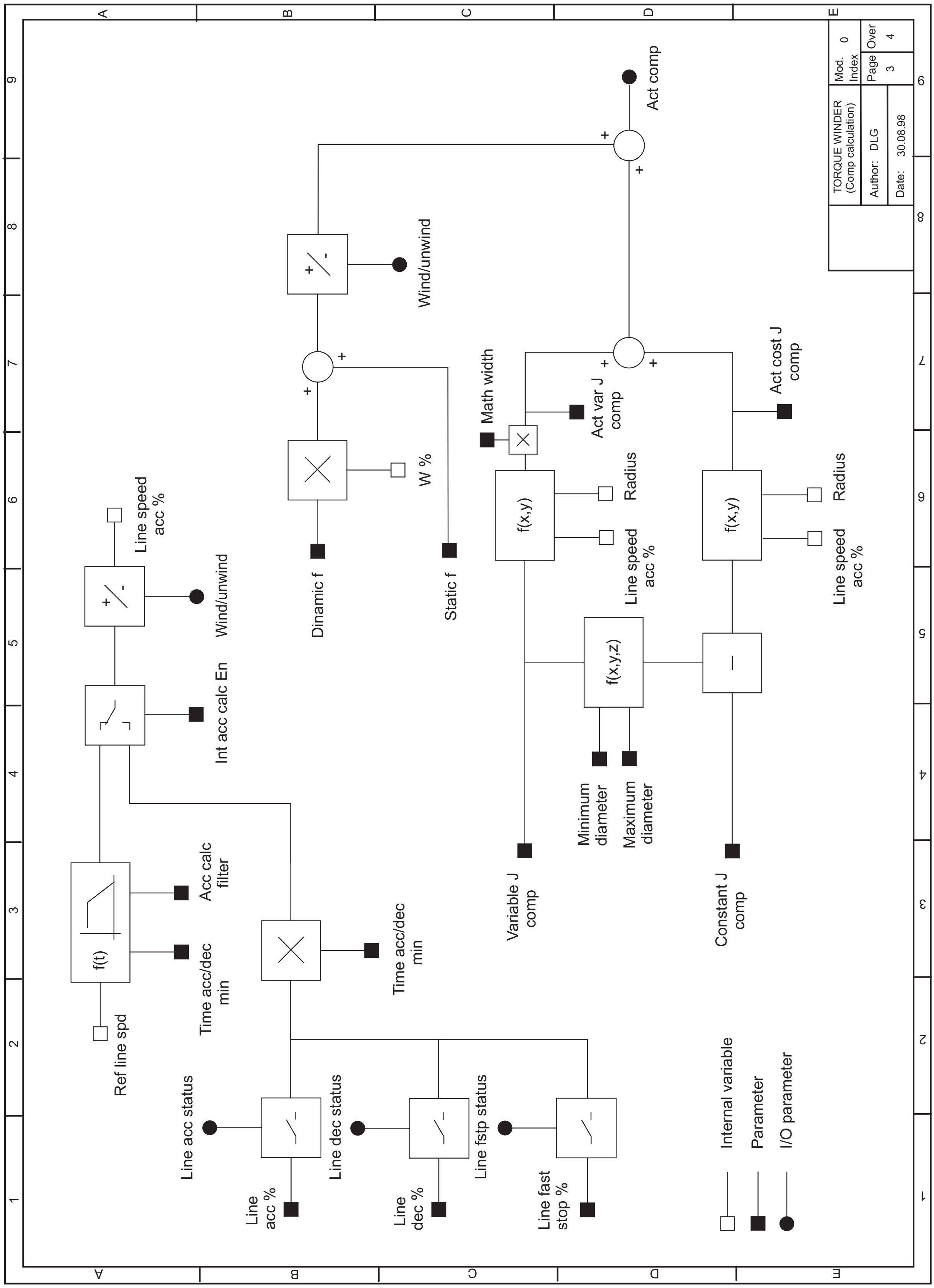
6.7 Functional diagram



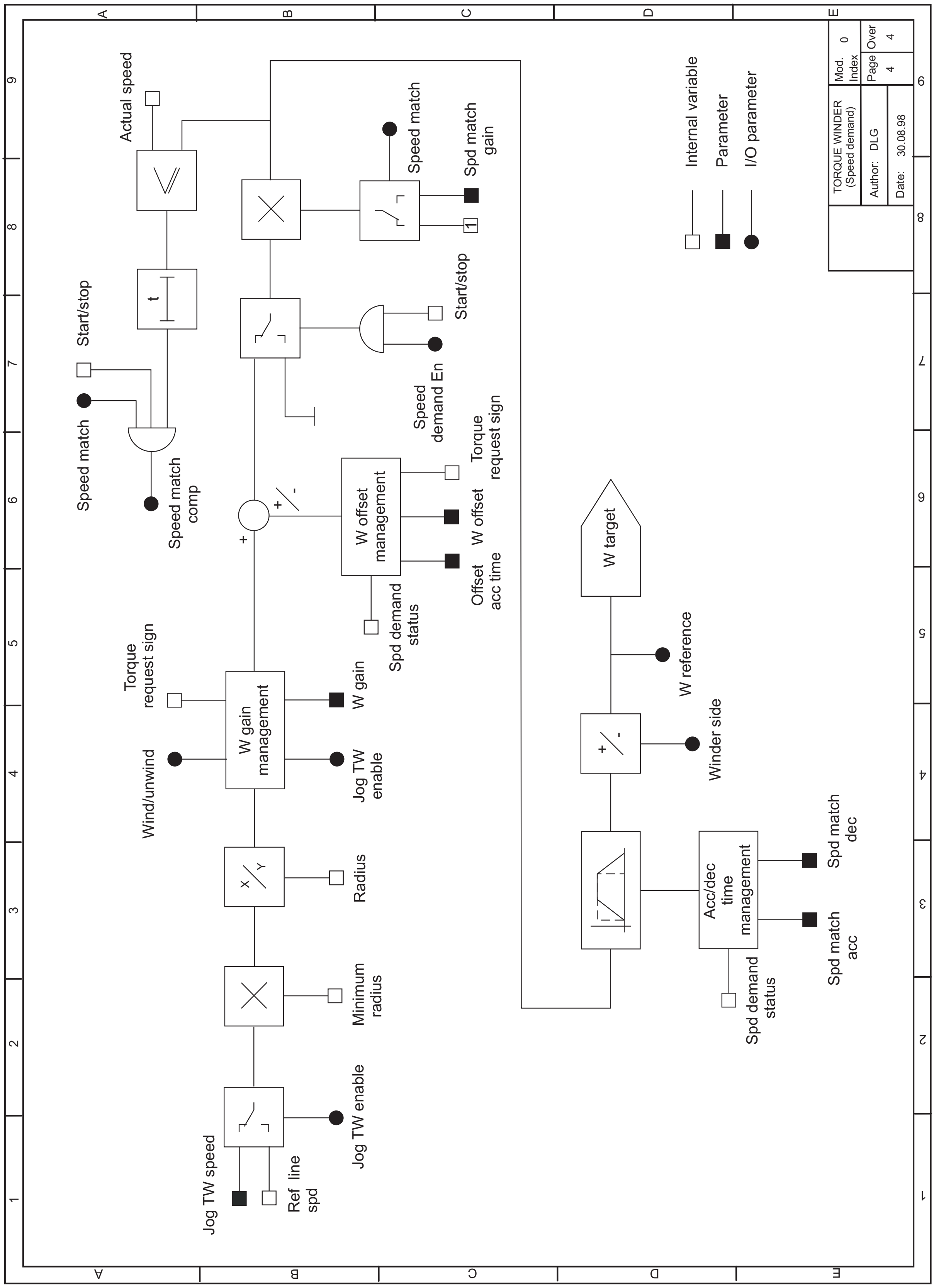
6.7 Functional diagram



6.7 Functional diagram



6.7 Functional diagram



7 - Troubleshooting

7.1 Precautions

DCVN DC drives must be installed and connected according to the recommendations given in Chapter 3.

Before any work is carried out on the DC drive, apply the safety recommendations given in Chapter 1, in particular those relating to powering off.

The screws on all terminals on the product must be tightened two weeks after first use. Thereafter retighten each year.

7.2 Fault message

Error message displayed on the keyboard

Error message	*Possible causes*
Failure supply	Fault in internal power supply: the voltage is above the permitted value
WARNING!	switch off voltages before disconnecting. In most cases, this will be from external cabling. Disconnect the terminals which can be removed from the control board and reset using the Cancel key. If no other fault is shown, check there is not a short circuit on the control cabling or even on the cable shielding. If the fault persists, disconnect the optional DCVS562 board (if present) and try to acknowledge again. If this attempt also fails, contact Schneider Electric
Undervoltage	Undervoltage on the power circuit supply. - Parameter **Undervolt thr** wrongly configured (may be 500V, while the DC drive is working on 400V). - Grid voltage to low or voltage drops too long - Bad connection (e.g.: terminals on switch or armatures badly tightened). - Line fuses fused. - Micro power cuts on the grid, or large distortion in supply voltage. - The DC drive must be enabled in the absence of the grid supply voltage.
Overvoltage	Overvoltage in the armature circuit. - Setting of **Max out voltage** parameter too low. - The DC drive does not operate in field weakening mode while the fixed speed can only be reached when the field excitation current is reduced. Check the parameter **Flux reg mode**.
Heatsink	Heatsink temperature too high. - Ambient temperature too high. - DC drive fan defect (DC drives> 110A) - Heatsink dirty.
Overtemp Motor	Temperature of motor too high (indicated by the thermistor to terminals 78/79) - Breakage or short-circuit in the wires between the motor and terminals 78/79. - Motor overheating: Thermal cycle of motor exceeded Ambient temperature too high The motor has an external fan: ventilation broken down or turning in wrong direction The motor has no external fan: load too high at low speed.

7.2 Fault message

Error message	*Possible causes*
External fault	External fault, connected to terminal 15
Overcurrent	Overcurrent in the motor circuit - Short circuit or earthing fault on the output from the DC drive - Badly optimized current regulator - Parameter **Overcurrent thr** too low.
Field loss	Excitation current too low - Excitation regulation is blocked - The supply to the excitation regulator is disconnected - Defective fuses in the energising circuit.
Speed fbk loss	No speed feedback signal - The speed feedback wires are disconnected or short-circuiting - The tachogenerator is connected the wrong way round - One or more encoder channels are missing (wires disconnected or short-circuiting, faulty power supply).
Opt2 failure	Fault on «Option 2» board. - Acknowledge using Cancel key. If the fault does not go away, it may be an internal fault on the board. Replace the board
Bus loss	Fault in the bus link (only with optional board DCVS5Z27) - Check wiring and tightness of connections - Acknowledge using Cancel key. If the fault does not go away, it may be an internal fault on the board. Replace the board
Enable seq err	Wrong DC drive release sequence - Correct the sequence according to the instructions on page 5/61.
Hw opt1 failure	Fault on «Option 1» board. - Acknowledge using Cancel key. If the fault does not go away, it may be an internal fault on the board. Replace the board
Brake error	Mechanical brake fault - The DC drive has not managed to establish the selected tension within the time specified by the **Torque delay** parameter - The brake feedback has not been received within the allotted time - The brake feedback remains for 1 second after the closure order has been given to it.

Other faults

Faults *Possible causes*

The keyboard display is dark

- Lack of supply voltage to terminals U2/V2 or internal fuses fused.

The motor does not run

- Run and/or Start command missing
- The DC drive is not accepting commands: procedure wrongly selected
- The input circuit breaker has triggered or the ultra-fast fuses have fused.
- The analog input used for the reference value has not been assigned or has been assigned incorrectly.
- Negative reference applied to the DCVN94. The reference for the 2-quadrant DC drives must always be positive.

The motor turns in the wrong direction

- Incorrect reference polarity (with DCVN104)
- The motor connections are reversed. WARNING: when the motor turns in the wrong direction and the direction of rotation must be changed, switch round the armature or field wires as well as the two connections of the tachogenerator or the encoder (A+ with A- or B+ with B-).

The motor does not reach the set speed

DC drive at speed limit: check parameters **Speed base value**, **Speed max amount**, **Speed max pos** and **Speed max neg**.

DC drive at current limit (Led I_{lim} illuminated). Possible causes:

- Motor overloaded
- DC drive too small
- Reduction of tension selected via Torque reduct.

The input value for the number of pulses per encoder turns is too high. Check the parameters concerned (**encoder 1 pulses** by using connector XE1 or **encoder 2 pulses** with use of connector XE2) and set the correct value.

Incorrect adaptation of the tachogenerator feedback. Check the voltage range choice (switch S4). Check parameter **Tacho scale**.

The factor function has not been configured correctly.

The motor immediately reaches its maximum speed

Reference value at the terminal block: Check if the value varies from the minimum value to the maximum value.

Reference potentiometer: is there a 0V connection?

Encoder/tachogenerator not connected, badly connected or do not have a power supply: Select parameter **Actual spd** in the DRIVE STATUS menu.

With the regulator disabled, run the motor in a clockwise direction (facing the shaft). The value shown must be positive.

If the value shown does not change or if inconsistent values are displayed, check the wiring to the tachogenerator and the power supply to the encoder.

If the value shown is negative, change round connections A+ and A- or B+ and B- of the encoder or of the tachogenerator.

Faults	*Possible causes*
The motor accelerates too slowly	
	Ramp incorrectly defined
	Motor working at limit of current Motor overloaded DC drive too small
The motor decelerates too slowly	
	Ramp values and times incorrectly defined
	Braking current too low (DCVN104 only).
The motor runs slowly although the reference value = zero	
	Minimum speed selected
	Interference from unused analog inputs. Configure unused analog inputs to OFF.
	Disconnect the reference cable to the analog input used If the motor stops, the cause is external or the resistance of the 0V wire is too high. If the drive continues to run: adjust the offset to the analog input. Change the parameter **Offset input xx** so that the motor remains stopped.
The thermal state of the motor has been exceeded	
	Thermal cycle of motor too severe
	Thermal protection of motor badly adjusted
The motor does not provide the maximum traction and current	
	DC drive working at limit of current
	Check if the value for **Full load curr** in the CONFIGURATION menu is set correctly
	Check the value for the current limitation.
The speed during acceleration with maximum current is not linear	
	Reduce **Speed I** and **Speed P** proportionally. If this does not improve matters, optimize the regulator.
Speed oscillation	
	Check parameters **Speed I** and **Speed P**
	If the oscillations take place in the field weakening phase, check the parameters **Flux P** and **Flux I**, then parameters **Voltage P** and **Voltage I**.
	If this does not improve matters, optimize the regulator.
The drive is not stable over the whole speed range	
	Adjust and check the Variable Gains function.
Function motorpotentiometer not executed	
	Function not enabled. **Enable motor pot** = Enabled
	DC drive control from the terminal block: **Motor pot up** and/or **Motor pot down** have not been assigned to a digital input.

7.2 Fault message

Faults	*Possible causes*
Jog operation not possible	A Start command is always present Function not enabled. **Enable jog** = Enabled DC drive control from the terminal block: **Jog +** and/or **Jog -** have not been assigned to a digital input.
Internal speed reference value not applied	Function not enabled. Enab multi spd = Enabled DC drive control from the terminal block: **Speed sel 0** and **Speed sel 1** and **Speed sel 2** have not been assigned to a digital input.
Multi-Ramp function does not restart	Function not enabled. **Enab multi rmp** = Enabled DC drive control from the terminal block: **Ramp sel 0** and **Ramp sel 1** have not been assigned to a digital input.
Overload not possible	Function not enabled. **Enable overload** = Enabled
The R&L Search process does not end	Due to a special value of the motor inductance, the subprogram enters an unending cycle with no change in algorithm. Procedure: 1 - Check the two inductance values shown on the display 2 - Insert the average value as motor inductance during the self-tuning phase If the procedure still does not stop, repeat steps 1 and 2.

7 - Troubleshooting

7.3 Repairs

It is advised that repairs should only be carried out on the DC drive by specialist personnel from Schneider Electric.

If you carry out a repair yourself, observe the following points:

- When ordering spare parts, indicate the reference number and quantity of the part required and also the type and serial number of the DC drive to which they belong.

- When changing the DCVS5N44 control board, do not power the DC drive on without having previously checked the configuration of all switches and jumpers present on the board and in particular switch S15 which identifies the type and product of the DC drive.

- When changing the DCVS4B2● control block for drives with separate bridges, do not power the DC drive on without having previously checked the configuration of all switches and jumpers present on the board and in particular switch S15 which identifies the type and product of the DC drive, and the configuration of jumper S1 and switches S3-S4 present on the power interface board.

7.3.1 Separate spare parts

	For DCVN (A) DC drive	**Reference (B)**
Fuses integrated into the DC drive	104C77S (6)	DCVF4G59 (1)
	104M11S (6) – 94C77S (3)	DCVF4G60 (2)
	94M10S (3)	DCVF4G61 (2)
	104M15S (6)	DCVS7793 (3)
	104M14Y (6)	DCVS7804 (1)
	94M15S (6)	DCVS7799 (3)
	94M14Y (6)	DCVS7798 (3)
	104M20S (6) – 94M20S (6) – 94M20Y (6)	DCVS7802 (3)
	104M20Y (12)	DCVS7794 (2)
	104M27S (12) – 94M27S (12) – 94M27Y (12)	DCVS7797 (3)
	104M27Y (12)	DCVS7805 (1)
	104M30S (12) – 94M30S (12) – 94M30Y (12)	DCVS7799 (3)
	104M30Y (12)	DCVS7I93 (2)
Integrated field excitation fuses	D40S to C18S (2)	DCVS824B (10)
	C28S to 94M10S or 104M11S (2)	DCVS823B (10)
2 pre-assembled thyristor subassemblies with heatsink		
	104M15S – Upper module (3)	DCVS7B20 (1)
	104M15S – Lower module (3)	DCVS7B26 (1)
	104M14Y – Upper module (3)	DCVS7B23 (1)
	104M14Y – Lower module (3)	DCVS7B29 (1)
	104M20S – Upper module (3)	DCVS7B21 (1)
	104M20S – Lower module (3)	DCVS7B27 (1)
	104M20Y – Upper module (3)	DCVS7B24 (1)
	104M20Y – Lower module (3)	DCVS7B30 (1)
	104M27S – Upper module (3)	DCVS7B22 (1)
	104M27S – Lower module (3)	DCVS7B28 (1)
	104M27Y – Upper module (3)	DCVS7B25 (1)
	104M27Y – Lower module (3)	DCVS7B31 (1)
	94M15S - One phase module (3)	DCVS7B01 (1)
	94M14Y - One phase module (3)	DCVS7B04 (1)
	94M20S - One phase module (3)	DCVS7B02 (1)
	94M20Y - One phase module (3)	DCVS7B05 (1)
	94M27S - One phase module (3)	DCVS7B03 (1)
	94M27Y - One phase module (3)	DCVS7B06 (1)
	104M30S – Upper module (3)	DCVS7B34 (1)

7.3 Repairs

	For DCVN (A) DC drive	Reference (B)
	104M30S – Lower module (3)	DCVS7B36 (1)
	104M30Y – Upper module (3)	DCVS7B35 (1)
	104M30Y – Lower module (3)	DCVS7B37 (1)
	94M30S - One phase module (3)	DCVS7B32 (1)
	94M30Y - One phase module (3)	DCVS7B33 (1)
Power part fans	For separated control blocks DCVS4B21(1) and DCVS4B22 (1) and DC drives ●D70S (1)	DCVS7G76 (1)
	●C11S (1) ●C18S (1) ●C28S (2) ●C42S (2)	DCVS7G71 (1)
	●C65S (2)	DCVS7G78 (1)
	●C77S (3) to ●M11S (3)	DCVS7G17 (1)
	Power bridges ●M14Y (2) ●M15S (2) ●M20S (2)	DCVS7R24 (1)
	Power bridges 94M20Y (2)	DCVS7R25 (1)
	Power bridges 104M27S (2)	DCVS7R26 (1)
	Power bridges ●M30● (2)	DCVS7R26 (1)
Control module for DC drives with separate power bridges	●M15S (1) to ●M30S (1)	DCVNS4DCU03 (1)
	●M14Y (1) to ●M30Y (1)	DCVNS4DCU05 (1)
Control board	All DC drives (1)	DCVS5N44 (1)
Configuration terminal	**All DC drives (1)**	**DCVS5P0S (1)**

(A) The values between parentheses indicate the quantities mounted for each DC drive.
(B) The values between parentheses indicate the product packaging.

8 - List of parameters

Key

1	2	3	4			5	6	7	8	9
Parameter	No.	Format	Value			Standard Configurat.		Access via		
			min	max	Factory		Keyp.	RS	Term	D/P
Fast stop c No Fast Stop Fast Stop	316	U16	-	-	-	Term. 13 +15…30 V 0 V	-	R/W 1 0	14 H L	R/W 1 0
a				DRIVE STATUS						
Ramp ref 1 [FF] b	44	I16	-2 * P45	+2 * P45	0		Yes	R/W	IA, QA	R/W
Enable drive Enabled Disabled	314	U16	0	1	Disabled (0)	Term. 12 +15…30 V 0 V	Yes	R/W 1 0	12 H L	R/W 1 0

a	White text on a black background	Menu/sub-menu.
b	Black text on a white background	Accessible functions.
c	Parts on a grey background	Function not accessible from the keyboard. The corresponding parameter status only is displayed.
1	[FF] in the Parameter column	Dimension based on the factor function.
2	“N” column : (Number)	**Parameter number (decimal). The value 2000H (=decimal 8192) must be added to the number given in column “N”. to obtain the parameter address using RS485 or CANopen.**
3	“Format” column:	Internal parameter format: I = Integer (e.g.: I 16 = 16 bit integer). U= No polarity (e.g.: U32 = 32 bit, no polarity). Float = Floating value.

* When access to the parameter is via board DCVS5W04 automatic mode/PDC, the format is U16
** When access to the parameter is via board DCVS5W04 automatic mode/PDC, the format is I16
*** When access to the parameter is via board DCVS5W04 automatic mode/PDC, the least significant word of the parameter is used

4	“Value” columns	Minimum, maximum and factory-set values. S= the value depends on the size of the product.
5	“Standard Configuration” column:	Factory assignation or possibility of assignment.

(A) This parameter can be assigned to a programmable analog input.
(B) This parameter can be assigned to another analog input.
(C) This parameter can be assigned to a programmable analog input.
(D)This parameter can be assigned to a programmable digital output.
(E) = This parameter may be assigned to a programmable digital input.
(F) = Optional DCVS5V62 board must be present.
(G) This parameter is only accessible by a programmable digital input
(H) This parameter can be assigned to relay 2.
P.45 = Speed base value. Cannot exceed 8192

6	"Keyboard" column :	Yes = Parameter accessible via keyboard.
7	"RS" Column (RS485/Bus/DCVS5W04)	Parameter accessible via RS485 link, CANopen DCVS5Z27 board or via the DCVS5W04 applications development and programming board in "manual communications" mode Low priority. The figures indicate the value to be sent during communication to enable the parameter.
8	«Terminal» column (Terminals)	Parameters which might be assigned to one of the analogue input/output terminals or digital.
9	«D/P» Column (DCVS5W04/PDC)	Parameter available via asynchronous communication (see DCVS5W04) and/or Process Data Channel /PDC Manual). «DCVS5W04, in asynchronous communication mode» = Low priority «PDC» = High priority When using a bus link, parameters between [min = 0; max = 1] can be allocated to any virtual digital input (if there is an access code W) and/or virtual digital output (if there is an access code R). The figures indicate the value to be sent during communication to enable the parameter.
	IA, QA, ID, QD in the "Terminal" column	This gives access to the function through a programmable analogue or digital input or output. IA = analogue input QA = analogue output ID = digital input QD = digital output The figure which appears is the one through which the terminal is allocated.
	H, L in the "Terminal" column	Signal level (H=Status 1, L=Status 0) allowing the function to be enabled.
	R/W/Z/C	Can be accessed via the serial link, CANopen or via the applications development and programming board in "manual communications" or "asynchoronous" mode: R = Read, W = Write, Z= writing is only possible if the function is not enabled. C= command parameter (entering a value causes a command to be executed).
	X · Pyy	The value of the parameter may be min/max X times the value of parameter yy.

8 - List of parameters

8.1 List of parameters and menus

Parameter	No.	Format	Value min	max	Factory	Standard Configurat.	Keyp.	Access via RS	Term	D/P	Custom. values
Drive ready	380	U16	0	1	-		-	R	QD	R	
Drive ready								1	H	1	
Drive not ready								0	L	0	
Quick stop	343	U16	-	-	-		-	R/W	-	-	
No Quick stop								1			
Quick stop								0			
Start/Stop	315	U16	0	1		Term. 13	Yes	R/W	13	R/W	
Start						+15…30 V		1	H	1	
Stop						0 V		0	L	0	
Fast stop	316	U16	-	-	-	Term. 13	-	R/W	14	R/W	
No Fast Stop						+15…30 V		1	H	1	
Fast Stop						0 V		0	L	0	
DRIVE STATUS											
Ramp ref 1	44	I16	-2 * P45	+2 * P45	0		Yes	R/W	IA, QA	R/W	
Enable drive	314	U16	0	1	Disabled	Term. 12	Yes	R/W	12	R/W	
Enabled						+15…30 V		1	H	1	
Disabled					(0)	0 V		0	L	0	
Start/Stop	315	U16	0	1	Stop	Term. 13	Yes	R/W	13	R/W	
Start						+15…30 V		1	H	1	
Stop					(0)	0 V		0	L	0	
Output voltage [V]	233	Float **	0	999	-		Yes	R	QA	R	
Motor current [%]	199	I16	-250	250	-		Yes	R	QA	R	
Actual spd (rpm)	122	I16					Yes	R	QA	R	
Speed ref (rpm)	118	I16	-32768	+32767	-	(A)	Yes	R	QA	R	
Output power [Kw]	1052	Float	0.01	9999.99	-		Yes	R	-	-	
Flux current (A)	351	Float	0.1	99.9	S		Yes	R	-	-	
Mains voltage [V]	466	U16	0	999	-		Yes	R	-	-	
Digital I/Q					-		Yes	-	-	-	
START UP											
Speed base value	45	U32***	1	16383	1500		Yes	R/Z	-	R	
Nom flux curr [A]	374	Float	0.5	80.0	S		Yes	R/Z	-	-	
Speed-0 f weak	499	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Acc delta speed	21	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Acc delta time [s]	22	U16	0	65535	1		Yes	R/W	-	-	
Dec delta speed	29	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Dec delta time [s]	30	U16	0	65535	1		Yes	R/W	-	-	
START UP \ Motor data											
Motor nom flux [A]	280	Float	0.0	P374	P374x0.3		Yes	R/Z	-	-	
Flux reg mode	469	U16	0	2	Constant current		Yes	R/Z	-	-	
Constant current					(0)			0			
Voltage control								1			
External control								2			
Full load curr [A]	179	Float	0.1	I_{dN}	IdN		Yes	R/Z	-	-	
Motor max speed [rpm]	162	Float *	0	6553	1500		Yes	R/Z	-	R	
Max out voltage [V]	175	Float	20	999	400		Yes	R/Z	-	-	
Flux weak speed [%]	456	U16	0	100	100		Yes	R/Z	-	R	
START UP \ Limits											
T current lim [%]	7	U16	0	200	100		Yes	R/W	IA	R/W	
Flux current max [%]	467	U16	P468	100	100	(A), (C)	Yes	R/W	-	R/W	
Flux current min [%]	468	U16	0	P467	5		Yes	R/W	-	----	
Speed min amount	1	U32	0	2^{32}-1	0		Yes	R/Z	-	-	
Speed max amount	2	U32	0	2^{32}-1	5000		Yes	R/Z	-	-	
START UP \ Speed feed-back											
Speed fbk sel	414	U16	0	3	1		Yes	R/Z	-	R	
Encoder 1								0			
Encoder 2								1			
Tacho								2			

8 - List of parameters

8.1 List of parameters and menus

Parameter	No.	Format	Value			Standard Configurat.	Access via				Custom. values
			min	max	Factory		Keyp.	RS	Term	D/P	
Armature								3			
Tacho scale	562	Float	0.90	3.00	1.00		Yes	R/W	-	-	
Speed offset	563	Float	-20.00	+20.00	0.00		Yes	R/W	-	-	
Encoder 2 pulses	169	Float *	150	9999	1000		Yes	R/Z	-	R	
Enable fbk contr	457	U16	0	1	Enabled		Yes	R/Z	-	-	
Enabled					(1)			1			
Disabled								0			
Refresh enc 2	652	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
START UP \ Alamrs											
Undervolt thr [V]	481	U16	0	1000	230		Yes	R/W	-	-	
Overcurrent thr [%]	584	U16	0	200	110		Yes	R/W	-	-	
START UP \ Overload contr											
Enable overload	309	I16	0	1	Disabled		Yes	R/Z	-	-	
Enabled								1			
Disabled					(0)			0			
Overload mode	318	U16	0	1	Curr limited		Yes	R/W	-	-	
Curr limited					(0)			0			
Curr not limited								1			
I2t								2			
Overload current [%]	312	U16	P313	200	100		Yes	R/W	-	-	
Base current [%]	313	U16	0	P312 $\leq$ 100	80		Yes	R/W	-	-	
Overload time [s]	310	U16	0	65535	30		Yes	R/W	-	-	
Ovrld prealarm	1289	U16	0	1	-		Yes	R	-	-	
I2t accumulator	655	Float	0	100.00%	-		Yes	R	-	-	
Pause time [s]	311	U16	0	65535	300		Yes	R/W	-	-	
Overld available	406	U16	0	1		Dig. Output 4	-	R	QD	R	
Overload possible						(D)		1	H	1	
Overload not possible								0	L	0	
Overload state	407	U16	0	1		(D)	-	R	QD	R	
Current > limit value								1	H	1	
Current limit value								0	L	0	
START UP \ Analog inputs \Analog input 1											
Select input 1	70	U16	0	31	Ramp ref 1		Yes	R/Z	-	-	
OFF								0			
Jog reference								1			
Speed ref 1								2			
Speed ref 2								3			
Ramp ref 1					(-4)			4			
Ramp ref 2								5			
T current ref 1								6			
T current ref 2								7			
Adap reference								8			
T current limit								9			
T current lim +								10			
T current lim -								11			
Pad 0								12			
Pad 1								13			
Pad 2								14			
Pad 3								15			
Load comp								19			
PID offset 0								21			
PI central v3								22			
PID feed-back								23			
Flux current max								25			
Out vlt level								26			
Speed ratio								28			
Tension red								29			
Tension ref								30			
Preset 3								31			

8 - List of parameters

8.1 List of parameters and menus

Parameter	No.	Format	Value			Standard Configurat.	Access via				Custom. values
			min	max	Factory		Keyp.	RS	Term	D/P	
Scale input 1	72	Float	-10.000	10.000	1.000		Yes	R/W	-	-	
Auto tune inp 1 Auto tune	259	U16					Yes	C/W 1	-	-	
Offset input 1	74	I16	-32768	+32767	0		Yes	R/W	-	-	
START UP \ Analog inputs \Analog input 2											
Select input 2 (Select like Input 1)	75	U16	0	31	OFF (0)		Yes	R/Z	-	-	
Scale input 2	77	Float	-10.000	10.000	1.000		Yes	R/W	-	-	
Auto tune inp 2 Auto tune	260	U16					Yes	C/W 1	-	-	
Offset input 2	79	I16	-32768	+32767	0		Yes	R/W	-	-	
START UP \ Analog inputs \Analog input 3											
Select input 3 (Select like Input 1)	80	U16	0	31	OFF (0)		Yes	R/Z	-	-	
Scale input 3	82	Float	-10.000	10.000	1.000		Yes	R/W	-	-	
Auto tune inp 3 Auto tune	261	U16					Yes	C/W 1	-	-	
Offset input 3	84	I16	-32768	+32767	0		Yes	R/W	-	-	
DRIVE STATUS											
R&L Search OFF ON	452	U16	0	1	OFF		Yes	R/Z 0 1	-	-	
Enable drive Enabled Disabled	314	U16	0	1	Disabled (0)	Term. 12 +15…30 V 0 V	Yes	R/W 1 0	12 H L	R/W 1 0	
Start/Stop Start Stop	315	U16	0	1	Stop (0)	Term. 13 +15…30 V 0 V	Yes	R/W 1 0	13 H L	R/W 1 0	
START UP \ Speed self tune											
Fwd-Rev spd tune Fwd direction Rev direction	1029	U16	1	2	Fwd Direction (1)		Yes	R/Z 1 2	-	-	
Test T curr lim [%]	1048	U16	0	S	20		Yes	R/Z	-	-	
Start	1027	U16	0	65535	-		Yes	C	-	-	
Inertia [kg*m*m*]	1014	Float	0.001	999.999	S		Yes	R/W	-	-	
Inertia Nw [kg*m*m]	1030	Float	0.001	999.999	-		Yes	R	-	-	
Friction [N*m]	1015	Float	0.000	99.999	S		Yes	R/W	-	-	
Friction Nw [N*m]	1031	Float	0.00	99.99	-		Yes	R	-	-	
Speed P [%]	87	Float	0.00	100.00	S		Yes	R/W	-	-	
Speed P Nw [%]	1032	Float	0.00	100.00	-		Yes	R	-	-	
Speed I [%]	88	Float	0.00	100.00	S		Yes	R/W	-	-	
Speed I Nw [%]	1033	Float	0.00	100.00	-		Yes	R	-	-	
Take val	1028	U16	0	65535	-		Yes	Z/C	-	-	
START UP											
Main commands Digitals Terminals	252	U16	0	1	Term (0)		Yes	R/Z 1 0	-	-	
Control mode Bus Local	253	U16	0	1	Local (0)		Yes	R/Z 1 0	-	-	
Save parameters	256	U16					Yes	C/W (1)	-	-	
TUNING											
R&L Search ON OFF	452	U16	0	1	OFF (0)		Yes	R/Z 1 0	-	-	
Enable drive Enabled Disabled	314	U16	0	1	Disabled (0)	Term. 12 +15…30 V 0 V	Yes	R/W 1 0	12 H L	R/W 1 0	
Start/Stop	315	U16	0	1	Stop	Term. 13	Yes	R/W	13	R/W	

8.1 List of parameters and menus

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
Start						+15…30 V		1	H	1	
Stop					(0)	0 V		0	L	0	
TUNING \ Speed self tune											
Fwd-Rev spd tune	1029	U16	1	2	Fwd Direction		Yes	R/Z	-	-	
Fwd direction								1			
Rev direction					(1)			2			
Test T curr lim [%]	1048	U16	0	S	20		Yes	R/Z	-	-	
Start	1027	U16	0	65535	-		Yes	C	-	-	
Inertia [kg*m*m]	1014	Float	0.001	999.999	S		Yes	R/W	-	-	
Inertia Nw [kg*m*m]	1030	Float	0.001	999.999	-		Yes	R	-	-	
Friction [N*m]	1015	Float	0.000	99.999	S		Yes	R/W	-	-	
Friction Nw [N*m]	1031	Float	0.00	99.99	-		Yes	R	-	-	
Speed P [%]	87	Float	0.00	100.00	S		Yes	R/W	-	-	
Speed P Nw [%]	1032	Float	0.00	100.00	-		Yes	R	-	-	
Speed I [%]	88	Float	0.00	100.00	S		Yes	R/W	-	-	
Speed I Nw [%]	1033	Float	0.00	100.00	-		Yes	R	-	-	
Take val	1028	U16	0	65535	-		Yes	Z/C	-	-	
TUNING											
Speed P [%]	87	Float	0.00	100.00	10.00		Yes	R/W	-	-	
Speed I [%]	88	Float	0.00	100.00	1.00		Yes	R/W	-	-	
Prop filter [ms]	444	U16	0	1000	0		Yes	R/W	-	-	
Flux P [%]	91	Float	0.00	100.00	2.00		Yes	R/W	-	-	
Flux I [%]	92	Float	0.00	100.00	1.00		Yes	R/W	-	-	
Voltage P [%]	493	Float	0.00	100.00	30.00		Yes	R/W	-	-	
Voltage I [%]	494	Float	0.00	100.00	40.00		Yes	R/W	-	-	
Save parameters	256	U16					Yes	C/W (1)	-	-	
MONITOR											
Enable drive	314	U16	0	1	Disabled	Term. 12	Yes	R/W	12	R/W	
Enabled						+15…30 V		1	H	1	
Disabled					(0)	0 V		0	L	0	
Start/Stop	315	U16	0	1	Stop	Term. 13	Yes	R/W	13	R/W	
Start						+15…30 V		1	H	1	
Stop					(0)	0 V		0	L	0	
MONITOR \ Measurements \ Speed \ Speed in DRC [ ]											
Ramp ref (d)	109	I16	-32768	+32767	-	(A)	Yes	R	-	R	
Ramp output (d)	112	I16	-32768	+32767	-		Yes	R	-	R	
Speed ref (d)	115	I16	-32768	+32767	-	(A)	Yes	R	-	R	
Actual spd (d)	119	I16	-32768	+32767	-		Yes	R	-	R	
F act spd (d)	925	I16	-32768	+32767	-	(A)	Yes	R	-	R	
Act spd filter [s]	923	Float	0.001	1.000	0.100		Yes	R/W	-	-	
MONITOR \ Measurements \ Speed \ Speed in rpm											
Ramp ref (rpm)	110	I16	-32768	+32767	-	(A)	Yes	R	QA	R	
Ramp outp (rpm)	113	I16	-32768	+32767	-	(A)	Yes	R	QA	R	
Speed ref (rpm)	118	I16	-32768	+32767	-	(A)	Yes	R	QA	R	
Actual spd (rpm)	122	I16	-8192	+8192	-		Yes	R	QA	R	
Enc 1 speed (rpm)	427	I16	-8192	+8192	-		Yes	R		R	
Enc 2 speed (rpm)	420	I16	-8192	+8192	-		Yes	R		R	
F act spd (rpm)	924	I16	-32768	+32767	-	(A)	Yes	R	QA	R	
Act spd filter [s]	923	Float	0.001	1.000	0.100		Yes	R/W	-	-	
MONITOR \ Measurements \ Speed \ Speed in %											
Ramp ref (%)	111	Float	-200.0	+ 200.0	-	(A)	Yes	R	-	-	
Ramp output (%)	114	Float	-200.0	+ 200.0	-		Yes	R	-	-	
Speed ref (%)	117	Float	-200.0	+ 200.0	-	(A)	Yes	R	-	-	
Actual spd (%)	121	Float	-200.0	+ 200.0	-		Yes	R	-	-	
MONITOR \ Measurements											
Mains voltage [V]	466	U16	0	999	-	(A)	Yes	R	-	-	
Mains frequency [Hz]	588	Float	0.0	70.0	-		Yes	R	-	-	
Output power [Kw]	1052	Float	0.01	9999.99	-		Yes	R	-	-	

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
Output voltage [V]	233	Float **	0	999	-	(A)	Yes	R	QA	R	
Motor current [%]	199	I16	-250	250	-	(A)	Yes	R	QA	R	
F T curr (%)	928	I16	-500	+500	-	(A)	Yes	R	QA	R	
T curr filter [s]	926	Float	0.001	0.250	0.100		Yes	R/W	-	-	
T current ref [%]	41	I16	-200	+200	-	(A)	Yes	R	QA	R	
Flux reference [%]	500	Float	0.0	100.0	-	(A)	Yes	R	QA	-	
Flux current [%]	234	Float *	0.0	100.0	-	(A)	Yes	R	QA	R	
Flux current (A)	351	Float	0.1	99.9	S		Yes	R	-	-	
MONITOR \ I/O											
Digital I/Q					-		Yes	-	-	-	
Dig input term	564	U16	0	65535	-		-	R	-	R	
Dig input term 1	565	U16	0	1	-		-	R	-	R	
Dig input term 2	566	U16	0	1	-		-	R	-	R	
Dig input term 3	567	U16	0	1	-		-	R	-	R	
Dig input term 4	568	U16	0	1	-		-	R	-	R	
Dig input term 5	569	U16	0	1	-		-	R	-	R	
Dig input term 6	570	U16	0	1	-		-	R	-	R	
Dig input term 7	571	U16	0	1	-		-	R	-	R	
Dig input term 8	572	U16	0	1	-		-	R	-	R	
Dig input term 9	573	U16	0	1	-		-	R	-	R	
Dig input term 10	574	U16	0	1	-		-	R	-	R	
Dig input term 11	575	U16	0	1	-		-	R	-	R	
Dig input term 12	576	U16	0	1	-		-	R	-	R	
Dig input term 15	579	U16	0	1	-		-	R	-	R	
Dig input term 16	580	U16	0	1	-		-	R	-	R	
Dig output term	581	U16	0	65535	-			R	-	R	
Virtual dig inp	582	U16	0	65535	-		Yes	R	-	-	
Virtual dig out	583	U16	0	65535	-		Yes	R	-	-	
INPUT VARIABLES \ Ramp ref \ Ramp ref 1											
Ramp ref 1	44	I16	-2 * P45	+2 * P45	0	Analog inp.1	Yes	R/W	IA, QA	R/W	
Ramp ref 1 (%)	47	Float	-200.0	+200.0	0	(Terminals 1+2) (B)	Yes	R/W	-	-	
INPUT VARIABLES \ Ramp ref \ Ramp ref 2											
Ramp ref 2	48	I16	-2 * P45	+2 * P45	0	(B)	Yes	R/W	IA, QA	R/W	
Ramp ref 2 (%)	49	Float	-200.0	+200.0	0		Yes	R/W	-	-	
INPUT VARIABLES \ Speed ref \ Speed ref 1											
Speed ref 1	42	I16	-2 * P45	+2 * P45	0	Ramp output (C)	Yes	R/W	IA, QA	R/W	
Speed ref 1 (%)	378	Float	-200.0	+200.0	0		Yes	R/W	-	-	
INPUT VARIABLES \ Speed ref \ Speed ref 2											
Speed ref 2	43	I16	-2 * P45	+2 * P45	0	(C)	Yes	R/W	IA, QA	R/W	
Speed Ref 2 (%)	379	Float	-200.0	+200.0	0		Yes	R/W	-	-	
INPUT VARIABLES \ T current ref											
T current ref 1 [%]	39	I16	-200	+200	0	Speed regulator output (C)	Yes	R/W	IA, QA	R/W	
T current ref 2 [%]	40	I16	-200	+200	0	(C)	Yes	R/W	IA, QA	-	
LIMITS \ Speed limits \ Speed amount											
Speed min amount	1	U32	0	2^{32}-1	0		Yes	R/Z	-	-	
Speed max amount	2	U32	0	2^{32}-1	5000		Yes	R/Z	-	-	
LIMITS \ Speed limits \ Speed min/max											
Speed min pos	5	U32	0	2^{32}-1	0		Yes	R/Z	-	-	
Speed max pos	3	U32	0	2^{32}-1	5000		Yes	R/Z	-	-	
Speed min neg	6	U32	0	2^{32}-1	0		Yes	R/Z	-	-	
Speed max neg	4	U32	0	2^{32}-1	5000		Yes	R/Z	-	-	
Speed limited	372	U16	0	1		(D)	-	R	QD	R	

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Parameter	No.	Format	Value			Standard Configurat.	Access via				Custom. values
			min	max	Factory		Keyp.	RS	Term	D/P	
Speed limited								1	H	1	
Speed not limited								0	L	0	
LIMITS \ Current limits											
T current lim type	715	U16	0	1	0		Yes	R/Z	-	-	
T lim mot gen								1			
T lim +/-								0			
T current lim [%]	7	U16	0	200	100	(E)	Yes	R/W	IA	R/W	
T current lim + [%]	8	U16	0	200	100	(E)	Yes	R/W	IA	R/W	
T current lim - [%]	9	U16	0	200	100	(E)	Yes	R/W	IA	R/W	
Curr limit state	349	U16	0	1		Digital output 5	-	R	QD	R	
Curr. limit reached						(D)		1	H	1	
Curr. limit not reached								0	L	0	
In use Tcur lim+ [%]	10	U16	0	200			Yes	R	-	R	
In use Tcur lim- [%]	11	U16	0	200			Yes	R	-	R	
Current lim red [%]	13	U16	0	200	100		Yes	R/W	-	R/W	
Torque reduct	342	U16	0	1	Not active	(E)	Yes	R/W	ID	R/W	
Active								1	H	1	
Not active					(0)			0	L	0	
LIMITS \ Flux limits											
Flux current max [%]	467	U16	P468	100	100	(A), (C)	Yes	R/W	-	R/W	
Flux current min [%]	468	U17	0	P467	5		Yes	R/W	-	----	
RAMP \ Acceleration											
Acc delta speed	21	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Acc delta time [s]	22	U16	0	65535	1		Yes	R/W	-	-	
RAMP \ Deceleration											
Dec delta speed	29	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Dec delta time [s]	30	U16	0	65535	1		Yes	R/W	-	-	
RAMP \ Quick stop											
QStp delta speed	37	U32	0	2^{32}-1	1000		Yes	R/W	-	-	
QStp delta time [s]	38	U16	0	65535	1		Yes	R/W	-	-	
RAMP											
Ramp shape	18	U16	0	1	Linear		Yes	R/Z	-	-	
S-Shaped								1			
Linear					0			0			
S shape t const [ms]	19	Float	100	3000	300		Yes	R/W	-	-	
S acc t const [ms]	663	Float	100	3000	300		Yes	R/W	-	-	
S dec t const [ms]	664	Float	100	3000	300		Yes	R/W	-	-	
Ramp +/- delay [ms]	20	U16	0	65535	100		Yes	R/W	-	-	
Fwd-Rev	673	U16	0	3	1		Yes	R/W	ID	R/W	
No direction								0		0	
Fwd direction								1		1	
Rev direction								2		2	
No direction								3		3	
Forward sign	293	U16	0	1	0		-	R/W	ID	R/W	
Reverse sign	294	U16	0	1	0		-	R/W	ID	R/W	
Enable ramp	245	I16	0	1	Enabled		Yes	R/Z	-	-	
Enabled					(1)			1			
Disabled								0			
Ramp out = 0	344	U16	0	1	Not active	(E)	Yes	R/W	ID	R/W	
Not active					(1)			1	H	1	
Active								0	L	0	
Ramp in = 0	345	U16	0	1	Not active	(E)	Yes	R/W	ID	R/W	
Not active					(1)			1	H	1	
Active								0	L	0	
Freeze ramp	373	U16	0	1	Not active	(E)	Yes	R/W	ID	R/W	
Not active					(1)			1	H	1	
Active								0	L	0	
Ramp +	346	U16	0	1	-	Digital output 1	-	R	QD	R	
Acc.CW+Dec.antiCW						(E)		1	H	1	

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
Other states								0	L	0	
Ramp - Acc.anti CW+DecCW Other states	347	U16	0	1	-	Digital output 2 (E)	-	R 1 0	QD H L	R 1 0	
Acc state Acc CW+Acc.antiCW Other states	1259	U16	0	1	-		-	R 1 0	QD H L	R 1 0	
Dec state Dec CW+Dec.antiCW Other states	1260	U16	0	1	-		-	R 1 0	QD H L	R 1 0	
SPEED REGULAT											
Speed ref [rpm]	118	I16	-32768	+32767	-	(A)	Yes	R	QA	R	
Speed reg output [%]	236	I16	-200	+200	-	T current ref (A)	Yes	R	QA	R	
Lock speed reg ON OFF	322	U16	0	1	OFF (0)	(E)	Yes	R/W 1 0	ID H L	R/W 1 0	
Enable spd reg Enabled Disabled	242	I16	0	1	Enabled (1)		Yes	R/Z 1 0	-	-	
Lock speed I Not active Active	348	U16	0	1	Not active (1)	(E)	Yes	R/W 1 0	ID H L	R/W 1 0	
Aux spd fun sel Inertia-loss cp Speed up	1016	U16	0	1	Speed up (0)	(E)	Yes	R/Z 1 0	-	-	
Prop filter [ms]	444	U16	0	1000	0		Yes	R/W	-	-	
SPEED REGULAT. \ Self tuning											
Fwd-Rev spd tune Fwd direction Rev direction	1029	U16	1	2	Fwd Direction (1)		Yes	R/Z 1 2	-	-	
Test T curr lim [%]	1048	U16	0	S	20		Yes	R/Z	-	-	
Start	1027	U16	0	65535	-		Yes	C	-	-	
Inertia [kg*m*m]	1014	Float	0.001	999.999	S		Yes	R/W	-	-	
Inertia Nw [kg*m*m]	1030	Float	0.001	999.999	-		Yes	R	-	-	
Friction [N*m]	1015	Float	0.000	99.999	S		Yes	R/W	-	-	
Friction Nw [N*m]	1031	Float	0.00	99.99	-		Yes	R	-	-	
Speed P [%]	87	Float	0.00	100.00	S		Yes	R/W	-	-	
Speed P Nw [%]	1032	Float	0.00	100.00	-		Yes	R	-	-	
Speed I [%]	88	Float	0.00	100.00	S		Yes	R/W	-	-	
Speed I Nw [%]	1033	Float	0.00	100.00	-		Yes	R	-	-	
Take val	1028	U16	0	65535	-		Yes	Z/C	-	-	
SPEED REGULAT \ Spd zero logic											
Enable spd=0 I Enabled Disabled	123	U16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-	
Enable spd=0 R Enabled Disabled	124	U16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-	
Enable spd=0 P Enabled Disabled	125	U16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-	
Spd=0 P gain [%]	126	Float	0.00	100.00	10.00		Yes	R/W	-	-	
Ref 0 level	106	U16	1	32767	10		Yes	R/W	-	-	
SPEED REGULAT \ Speed up											
Speed up gain [%]	445	Float	0.00	100.00	0.00		Yes	R/W	-	-	
Speed up base [ms]	446	Float	0	16000	1000		Yes	R/W	-	-	

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Parameter	No.	Format	Value			Standard	Access via				Custom.
			min	max	Factory	Configurat.	Keyp.	RS	Term	D/P	values
Speed up filter [ms]	447	U16	0	1000	0		Yes	R/W	-	-	
SPEED REGULAT \ Droop function											
Droop gain [%]	696	Float	0.00	100.00	0.00		Yes	R/W	-	-	
Droop filter [ms]	697	U16	0	1000	0		Yes	R/W	-	-	
Load comp [%]	698	I16	-200	+200	0	(C)	Yes	R/W	IA	R/W	
Droop limit	700	U16	0	2*P45	1500		Yes	R/W	-	-	
Enable droop	699	U16	0	1	Disabled	(E)	Yes	R/W	ID	R/W	
Enabled								1		1	
Disabled					(0)			0		0	
SPEED REGULAT \ Inertia/loss cp											
Inertia [kg*m*m]	1014	Float	0.001	999.999	S		Yes	R/W	-	-	
Friction [N*m]	1015	Float	0.000	99.999	S		Yes	R/W	-	-	
Torque const [N*m/A]	1013	Float	0.01	99.99	S		Yes	R	-	-	
Inertia c filter [ms]	1012	U16	0	1000	0		Yes	R/W	-	-	
CURRENT REGULAT											
T current ref [%]	41	I16	-200	+200	-	(A)	Yes	R	QA	R	
Motor current [%]	199	I16	-250	250	-		Yes	R	QA	R	
Arm resistance [ ]	453	Float	S	S	0.500		Yes	R/W	-	-	
Arm inductance [mH]	454	Float	S	S	4.00		Yes	R/W	-	-	
Current scale	1365	Float	0.3	2.0	1		Yes	R/W	-	-	
E int [V]	587	I16	-80	+80	-	(A)	Yes	R	QA	-	
R&L search	452	U16	0	1	OFF		Yes	R/Z	-	-	
ON								1			
OFF					(0)			0			
Zero torque	353	U16	0	1	Not active	(E)	Yes	R/W	ID	R/W	
Not active					(1)			1	H		
Active								0	L		
FLUX REGULATION											
Enable flux reg	497	U16	0	1	ON	(E)	Yes	R/W	ID	-	
ON					(1)			1	H		
OFF								0	L		
Flux reg mode	469	U16	0	2	Const. current		Yes	R/Z	-	-	
Constant current					(0)			0			
Voltage control								1			
External control								2			
Enable flux weak	498	U16	0	1	OFF	(E)	Yes	R/W	ID	-	
ON								1	H		
OFF					(0)			0	L		
Speed-0 f weak	499	U16	0	1	OFF		Yes	R/W	-	-	
ON								1			
OFF					(0)			0			
Flux reference [%]	500	Float*	0.0	100.0	0.0	(A)	Yes	R	QA	-	
Flux current [%]	234	Float*	0.0	100.0	-	(A)	Yes	R	QA	R	
Out vlt level	921	Float*	0	100.0	100.0	(A), (C)	Yes	R/W	IA, QA	R/W	
FLUX REGULATION \ Flux \ if curve											
I field cnst 40	916	Float	0	100.0	40.0		Yes	R/Z		-	
I field cnst 70	917	Float	0	100.0	70.0		Yes	R/Z		-	
I field cnst 90	918	Float	0	100.0	90.0		Yes	R/Z		-	
Set flux / if	919	U16					Yes	Z/C		-	
Reset flux / if	920	U16					Yes	Z/C		-	
Nom flux curr [A]	374	Float	0.5	80.0	S		Yes	R/Z	-	-	
Motor nom flux [A]	280	Float	0.0	P374	P374x0.3		Yes	R/Z	-	-	
REG PARAMETERS \ Percent values \ Speed regulator											
Speed P [%]	87	Float	0.00	100.0	10.00		Yes	R/W	-	-	
Speed I [%]	88	Float	0.00	100.0	1.00		Yes	R/W	-	-	
Speed P bypass [%]	459	Float	0.00	100.0	10.00		Yes	R/W	-	-	
Speed I bypass [%]	460	Float	0.00	100.0	1.00		Yes	R/W	-	-	
REG PARAMETERS \ Percent values \ Flux regulator											
Flux P [%]	91	Float	0.00	100.0	2.00		Yes	R/W	-	-	
Flux I [%]	92	Float	0.00	100.0	1.00		Yes	R/W	-	-	

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
REG PARAMETERS \ Percent values \ Voltage reg											
Voltage P [%]	493	Float	0.00	100.0	30.00		Yes	R/W	-	-	
Voltage I [%]	494	Float	0.00	100.0	40.00		Yes	R/W	-	-	
REG PARAMETERS \ Base values \ Speed regulator											
Speed P base	93	Float	0.001	S	0,300 P93max		Yes	R/Z	-	-	
Speed I base	94	Float	0.001	S	0,3 P94max		Yes	R/Z	-	-	
REG PARAMETERS \ Base values \ Flux regulator											
Flux P base	97	Float	1	32767	3277		Yes	R/Z	-	-	
Flux I Base	98	Float	1	32767	3277		Yes	R/Z	-	-	
REG PARAMETERS \ Base values \ Voltage reg											
Voltage P base	495	Float	0.0100	S	S		Yes	R/Z	-	-	
Voltage I base	496	Float	0.01	S	S		Yes	R/Z	-	-	
REG PARAMETERS \ In use values											
Speed P in use [%]	99	Float	0.00	100.00	S		Yes	R	-	-	
Speed I in use [%]	100	Float	0.00	100.00	S		Yes	R	-	-	
CONFIGURATION											
Main commands Digital Terminals	252	U16	0	1	Term. (0)		Yes	R/Z 1 0	-	-	
Control mode Bus Local	253	U16	0	1	Local (0)		Yes	R/Z 1 0	-	-	
Speed base value	45	U32***	1	16383	1500		Yes	R/Z	-	R	
Full load curr [A]	179	Float	0.1	I_{dN}	IdN		Yes	R/Z	-	-	
Max out voltage [V]	175	Float	20	999	400		Yes	R/Z	-	-	
Ok relay funct Ready to Start Drive healthy	412	I16	0	1	0		Yes	R/Z 1 0	-	-	
CONFIGURATION \ Speed fbk											
Motor max speed [rpm]	162	Float *	0	6553	1500		Yes	R/Z	-	R	
Speed fbk sel Encoder 1 Encoder 2 Tacho Armature	414	U16	0	3	1		Yes	R/Z 0 1 2 3	-	R	
Encoder 1 state Encoder ok Encoder Fault	648	U16	0	1			-	R 1 0	QD	R 1 0	
Enable fbk contr Enabled Disabled	457	U16	0	1	Enabled (1)		Yes	R/Z 1 0	-	-	
Enable fbk bypas Enabled Disabled	458	U16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-	
Flux weak speed [%]	456	U16	0	100	100		Yes	R/Z	-	R	
Speed fbk error [%]	455	U16	0	100	22		Yes	R/Z	-	-	
Tacho scale	562	Float	0.90	3.00	1.00		Yes	R/W	-	-	
Speed offset	563	Float	-20.00	+20.00	0		Yes	R/W	-	-	
Encoder 1 pulses	416	Float *	600	9999	1024		Yes	R/Z	-	R	
Encoder 2 pulses	169	Float *	150	9999	1000		Yes	R/Z	-	R	
Refresh enc 1 Enabled Disabled	649	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-	
Encoder 2 state Encoder ok Encoder Fault	651	U16	0	1			-	R 1 0	QD	R 1 0	
Refresh enc 2 Enabled	652	U16	0	1	Disabled		Yes	R/W 1	-	-	

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
Disabled					(0)			0			
Enable ind store	911	U16	0	1	Disabled		Yes	R/W	-	R/W	
Enabled								1			
Disabled					(0)			0			
Ind store ctrl	912	U16	0	65535	0		-	R/W	-	R/W	
Index storing	913	U32	0	$+2^{32}-1$	0		-	R	-	R	
CONFIGURATION \ Drive type											
Drive size [A]	465	U16	0	S	S		Yes	R	-	R	
2B + E	201	U16	0	1	OFF		Yes	R/Z		-	
ON								1			
OFF					(0)			0			
Size selection	464	U16	0	1	S		Yes	R/Z	-	-	
American								1			
Standard								0			
Software version	331	Text					Yes	R	-	-	
Drive type	300	U16	10	11	S		-	R	-	R	
DCVN94…								10		10	
DCVN104…								11		11	
CONFIGURATION \ Dimension fact											
Dim factor num	50	I32***	1	65535	1		Yes	R/Z	-	R	
Dim factor den	51	I32***	1	$+2^{31}-1$	1		Yes	R/Z	-	R	
Dim factor text	52	Text			rpm		Yes	R/Z	-	-	
CONFIGURATION \ Face value fact											
Face value num	54	I16	1	+32767	1		Yes	R/Z	-	R	
Face value den	53	I16	1	+32767	1		Yes	R/Z	-	R	
CONFIGURATION \ Prog alarms \ Failure supply											
Latch	194	U16	0	1	ON		Yes	R/Z	-	-	
ON					(1)			1			
OFF								0			
Ok relay open	195	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
CONFIGURATION \ Prog alarms \ Undervoltage											
Undervolt thr [V]	481	U16	0	1000	230		Yes	R/W	-	-	
Latch	357	U16	0	1	ON		Yes	R/Z	-	-	
ON					(1)			1			
OFF								0			
Ok relay open	358	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
Hold off time [ms]	470	U16	0	100	0		Yes	R/W	-	-	
Restart time [ms]	359	U16	0	65535	1000		Yes	R/W	-	-	
CONFIGURATION \ Prog alarms \ Overvoltage											
Activity	203	U16	0	2	Ignore		Yes	R/Z	-	-	
Ignore					(0)			0			
Warning								1			
Disable drive								2			
Latch	361	U16	0	1	ON		Yes	R/Z	-	-	
ON					(1)			1			
OFF								0			
Ok relay open	362	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
Hold off time [ms]	482	U16	0	10000	0		Yes	R/W	-	-	
Restart time [ms]	483	U16	0	10000	0		Yes	R/W	-	-	
CONFIGURATION \ Prog. Alarm \ Heatsink											
Activity	368	U16	1	5	Disable drive		Yes	R/Z	-	-	
Warning								1			
Disable drive								2			
Quick stop								3			

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Parameter	No.	Format	Value			Standard Configurat.	Access via				Custom. values
			min	max	Factory		Keyp.	RS	Term	D/P	
Normal stop								4			
Curr lim stop								5			
Ok relay open	370	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
CONFIGURATION \ Prog alarms \ Overtemp motor											
Activity	365	U16			Disable		Yes	R/Z	-	-	
Ignore					dive			0			
Warning								1			
Disable drive								2			
Quick stop								3			
Normal stop								4			
Curr lim stop								5			
Ok relay open	367	I16			ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
CONFIGURATION \ Prog alarms \ External fault											
Activity	354	U16	1	5	Disable drive		Yes	R/Z	-	-	
Warning								1			
Disable drive								2			
Quick stop								3			
Normal stop								4			
Curr lim stop								5			
Latch	355	U16	0	1	ON		Yes	R/Z	-	-	
ON					(1)			1			
OFF								0			
Ok relay open	356	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
Hold off time [ms]	502	U16	0	10000	0		Yes	R/W	-	-	
Restart time [ms]	501	U16	0	10000	0		Yes	R/W	-	-	
CONFIGURATION \ Prog alarms \ Brake fault											
Activity	1296	U16			Ignore		Yes	R/Z	-	-	
Ignore					(0)			0			
Warning								1			
Disable drive								2			
Quick stop								3			
Normal stop								4			
Curr lim stop								5			
Ok relay open	1297	I16			ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
CONFIGURATION \ Prog alarms \ I2t overload											
Activity	1366	U16	0	2	Disable drive		Yes	R/Z	-	-	
Ignore								0			
Warning								1			
Disable drive					(2)			2			
Ok relay open	1367	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
CONFIGURATION \ Prog alarms \ Overcurrent											
Overcurrent thr [%]	584	U16	0	200	110		Yes	R/W	-	-	
Activity	212	U16	0	2	Ignore		Yes	R/Z	-	-	
Ignore					(0)			0			
Warning								1			
Disable drive								2			
Latch	363	U16	0	1	ON		Yes	R/Z	-	-	
ON					(1)			1			
OFF								0			
Ok relay open	364	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
OFF								0			
Hold off time [ms]	586	U16	0	10000	0		Yes	R/W	-	-	
Restart time [ms]	585	U16	0	10000	0		Yes	R/W	-	-	
CONFIGURATION \ Prog alarms \ Field loss											
Activity	473	U16	0	2	Disable drive		Yes	R/Z	-	-	
Ignore								0			
Warning								1			
Disable drive								2			
Latch	471	U16	0	1	ON		Yes	R/Z	-	-	
ON					(1)			1			
OFF								0			
Ok relay open	472	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
Hold off time [ms]	475	U16	0	10000	0		Yes	R/W	-	-	
Restart time [ms]	474	U16	0	10000	0		Yes	R/W	-	-	
CONFIGURATION \ Prog alarms \ Speed fbk loss											
Activity	478	U16	1	2	Disable drive		Yes	R/Z	-	-	
Warning								1			
Disable drive								2			
Ok relay open	477	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
Hold off time [ms]	480	U16	0	10000	8		Yes	R/W	-	-	
CONFIGURATION \ Prog alarms \ Opt2 failure											
Activity	639	U16	0	5	Disable drive		Yes	R/Z	-	-	
Disable drive								2			
Quick stop								3			
Normal stop								4			
Curr lim stop								5			
Ok relay open	640	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
CONFIGURATION \ Prog alarms \ Bus loss											
Activity	634	U16	0	5	Disable drive		Yes	R/Z	-	-	
Ignore								0			
Warning								1			
Disable drive								2			
Quick stop								3			
Normal stop								4			
Curr lim stop								5			
Latch	633	U16	0	1	ON		Yes	R/Z	-	-	
ON					(1)			1			
OFF								0			
Ok relay open	635	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
Hold off time [ms]	636	U16	0	10000	0		Yes	R/W	-	-	
Restart time [ms]	637	U16	0	10000	0		Yes	R/W	-	-	
CONFIGURATION \ Prog alarms \ Hw opt1 failure											
Activity	386	U16	1	5	Disable drive		Yes	R/Z	-	-	
Warning								1			
Disable drive								2			
Quick stop								3			
Normal stop								4			
Curr lim stop								5			
Ok relay open	387	I16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
CONFIGURATION \ Prog alarms \ Enable seq err											
Activity	728	U16	0	2	Disable drive		Yes	R/Z	-	-	

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
Ignore								0			
Disable drive								2			
Latch	729	U16	0	1	ON		Yes	R/Z	-	-	
ON					(1)			1			
OFF								0			
Ok relay open	730	U16	0	1	ON		Yes	R/W	-	-	
ON					(1)			1			
OFF								0			
CONFIGURATION \ Set serial comm											
Device address	319	U16	0	255	0		Yes	R/Z	-	-	
Ser answer delay	408	U16	0	900	0		Yes	R/W	--	---	
Ser protocol sel	323	U16	0	2	SLINK3		Yes	R/W	--	---	
SLINK3					(0)			0			
MODBUS RTU								1			
JBUS								2			
Ser baudrate sel	326	U16	0	4	9600		Yes	R/W	--	---	
19200								0			
9600					(1)			1			
4800								2			
2400								3			
1200								4			
CONFIGURATION											
Pword 1	85	I32	0	99999	-		Yes	W	-	-	
I/O CONFIG \ Analog outputs \ Analog output 1											
Select output 1	66	U16	0	93	Actual speed		Yes	R/Z	-	-	
OFF								0			
Speed ref 1								1			
Speed ref 2								2			
Ramp ref 1								3			
Ramp ref 2								4			
Ramp ref								5			
Speed ref								6			
Ramp output								7			
Actual spd (rpm)					(8)			8			
T current ref 1								9			
T current ref 2								10			
T current ref								11			
Speed reg out								15			
Motor current								16			
Output voltage								20			
Analog input 1								24			
Analog input 2								25			
Analog input 3								26			
Flux current								27			
Pad 0								31			
Pad 1								32			
Pad 4								33			
Pad 5								34			
Flux reference								35			
Pad 6								38			
PID output								39			
Out vlt level								79			
Flux current max								80			
F act spd (rpm)								81			
F T curr (%)								82			
Spd draw out								84			
Output power								88			
Roll Diameter								89			
Act tension ref								90			
Torque current								91			
W reference								92			
Actual comp								93			

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
Brake current								94			
Scale output 1	62	Float	-10.000	+10000	0		Yes	R/W	-		
I/O CONFIG \ Analog outputs \ Analog output 2											
Select output 2	67	U16	0	93	Motor current		Yes	R/Z	-	-	
(Select like output 1)					(16)						
Scale output 2	63	Float	-10.000	+10000	0		Yes	R/W	-	-	
I/O CONFIG \ Analog outputs \ Analog output 3											
Select output 3	68	U16	0	93	Flux	(F)	Yes	R/Z	-	-	
(Select like output 1)					(27)						
Scale output 3	64	Float	-10.000	+10000	0		Yes	R/W	-	-	
I/O CONFIG \ Analog outputs \ Analog output 4											
Select output 4	69	U16	0	93	Output voltage	(F)	Yes	R/Z	-	-	
(Select like output 1)					(20)						
Scale output 4	65	Float	-10.000	+10000	0		Yes	R/W	-	-	
I/O CONFIG \ Analog inputs \ Analog input 1											
Select input 1	70	U16	0	31	Ramp	Term. 1/2	Yes	R/Z	-	-	
OFF					ref 1			0			
Jog reference								1			
Speed ref 1								2			
Speed ref 2								3			
Ramp ref 1					(4)			4			
Ramp ref 2								5			
T current ref 1								6			
T current ref 2								7			
Adap reference								8			
T current limit								9			
T current lim +								10			
T current lim -								11			
Pad 0								12			
Pad 1								13			
Pad 2								14			
Pad 3								15			
Load comp								19			
PID offset 0								21			
PI central v3								22			
PID feed-back								23			
Flux current max								25			
Out vlt level								26			
Speed ratio								28			
Tension red								29			
Tension ref								30			
Preset 3								31			
Brake ref								32			
An in 1 target	295	U16	0	1	0		Yes	R/W	ID	R/W	
Not assigned								1	H	1	
Assigned								0	L	0	
Input 1 type	71	U16	0	2	± 10 V		Yes	R/Z	-	-	
-10V ... + 10 V								0			
0...20 mA, 0...10 V								1			
4...20 mA								2			
Input 1 sign	389	U16	0	1	1	(E)	Yes	R/W	-	R/W	
Positive								1		1	
Negative								0		0	
Scale input 1	72	Float	-10.000	10.000	1.000		Yes	R/W	-	-	
Tune value inp 1	73	Float	0.100	10.000	1.000		Yes	R/W	-	-	
Auto tune inp 1	259	U16					Yes	C/W	-	-	
Auto tune								1			
Input 1 filter [ms]	792	U16	0	1000	0		Yes	R/W	-	R/W	
Input 1 compare	1042	I16	-10000	+10000	0		Yes	R/W	-	-	
Input 1 cp error	1043	U16	0	10000	0		Yes	R/W	-	-	
Input 1 cp delay	1044	U16	0	65000	0		Yes	R/W	-	-	

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
Input 1 cp match Input 1=thr.val. Input 1 not thr.val.	1045	U16	0	1	-	(D)	-	R 1 0	QD H L	R	
Offset input 1	74	I16	-32768	+32767	0		Yes	R/W	-	-	
I/O CONFIG \ Analog inputs \ Analog input 2											
Select input 2 (Select like Input 1)	75	U16	0	31	OFF (0)	Term. 3/4	Yes	R/Z	-	-	
An in 2 target Assigned Not assigned	296	U16	0	1	0		Yes	R/W 0 1	ID L H	R/W 0 1	
Input 2 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	76	U16	0	2	± 10 V		Yes	R/Z 0 1 2	-	-	
Input 2 sign Positive Negative	390	U16	0	1	1	(E)	Yes	R/W 1 0	-	R/W 1 0	
Scale input 2	77	Float	-10.000	10.000	1.000		Yes	R/W	-	-	
Tune value inp 2	78	Float	0.100	10.000	1.000		Yes	R/W	-	-	
Auto tune inp 2 Auto tune	260	U16					Yes	C/W 1	-	-	
Offset input 2	79	I16	-32768	+32767	0		Yes	R/W	-	-	
I/O CONFIG \ Analog inputs \ Analog input 3											
Select input 3 (Select like Input 1)	80	U16	0	31	OFF (0)	Term. 5/6	Yes	R/Z	-	-	
An in 3 target Not assigned Assigned	297	U16	0	1	0		Yes	R/W 1 0	ID H L	R/W 1 0	
Input 3 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	81	U16	0	2	± 10 V		Yes	R/Z 0 1 2	-	-	
Input 3 sign Positive Negative	391	U16	0	1	1	(E)	Yes	R/W 1 0	-	R/W 1 0	
Scale input 3	82	Float	-10.000	10.000	1.000		Yes	R/W	-	-	
Tune value inp 3	83	Float	0.100	10.000	1.000		Yes	R/W	-	-	
Auto tune inp 3 Auto tune	261	U16					Yes	C/W 1	-	-	
Offset input 3	84	I16	-32768	+32767	0		Yes	R/W	-	-	
I/O CONFIG \ Digital outputs											
Digital output 1 OFF Speed zero thr Spd threshold Set speed Curr limit state Drive ready Overld available Overload state Ramp + Ramp - Speed limited Undervoltage Overvoltage Heatsink Overcurrent Overtemp motor External fault Failure supply Pad A bit Pad B bit	145	U16	0	61	Ramp + (8)		Yes	R/Z 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	-	-	

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Parameter	No.	Format	Value			Standard Configurat.	Access via				Custom. values
			min	max	Factory		Keyp.	RS	Term	D/P	
Virt dig input								20			
Torque sign								21			
Stop control								23			
Field loss								24			
Speed fbk loss								25			
Bus loss								26			
Hw opt1 failure								28			
Opt2 failure								29			
Encoder 1 state								30			
Encoder 2 state								31			
Enable seq err								35			
Diameter calc st								38			
Input 1 cp match								49			
Diam reached								58			
Spd match compl								59			
Acc state								60			
Dec state								61			
Brake comand								62			
Brake failure								63			
ChangeSetup								64			
Ovrld prealarm								65			
I2t ovrld failure								66			
Inversion out 1	1267	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital output 2	146	U16	0	61	Ramp -		Yes	R/Z	-	-	
(Select like output 1)					(9)						
Inversion out 2	1268	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital output 3	147	U16	0	61	Spd thr. (2)		Yes	R/Z	-	-	
(Select like output 1)											
Inversion out 3	1269	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital output 4	148	U16	0	61	Overld avail. (6)		Yes	R/Z	-	-	
(Select like output 1)											
Inversion out 4	1270	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital output 5	149	U16	0	61	Curr lim. State		Yes	R/Z	-	-	
(Select like output 1)					(4)						
Inversion out 5	1271	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital output 6	150	U16	0	61	Overvolt (12)		Yes	R/Z	-	-	
(Select like output 1)											
Inversion out 6	1272	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital output 7	151	U16	0	61	Undervolt(11)		Yes	R/Z	-	-	
(Select like output 1)											
Inversion out 7	1273	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital output 8	152	U16	0	61	Overcurr (14)		Yes	R/Z	-	-	
(Select like output 1)											
Inversion out 8	1274	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Relay 2	629	U16	0	61	Stop ctrl (23)		Yes	R/Z	-	-	

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
(Select like output 1)											
Inversion relay 2	1275	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
I/O CONFIG \ Digital inputs											
Digital input 1	137	U16	0	83	OFF		Yes	R/Z	-	-	
OFF					(0)			0			
Motor pot reset								1			
Motor pot up								2			
Motor pot down								3			
Motor pot sign +								4			
Motor pot sign -								5			
Jog +								6			
Jog -								7			
Failure reset								8			
Torque reduct								9			
Ramp out = 0								10			
Ramp in = 0								11			
Freeze ramp								12			
Lock speed reg								13			
Lock speed I								14			
Auto capture								15			
Input 1 sign +								16			
Input 1 sign -								17			
Input 2 sign +								18			
Input 2 sign -								19			
Input 3 sign +								20			
Input 3 sign -								21			
Zero torque								22			
Speed sel 0								23			
Speed sel 1								24			
Speed sel 2								25			
Ramp sel 0								26			
Ramp sel 1								27			
Field loss								29			
Enable flux reg								30			
Enable flux weak								31			
Pad A bit 0								32			
Pad A bit 1								33			
Pad A bit 2								34			
Pad A bit 3								35			
Pad A bit 4								36			
Pad A bit 5								37			
Pad A bit 6								38			
Pad A bit 7								39			
Forward sign								44			
Reverse sign								45			
An in 1 target								46			
An in 2 target								47			
An in 3 target								48			
Enable droop								49			
Enable PI PID								52			
Enable PD PID								53			
PI integral freeze								54			
PID offs. Sel								55			
PI central vs0								56			
PI central vs1								57			
Diameter calc								58			
Diam reset								68			
Diam calc Dis								69			
Torque winder EN								70			
Line acc status								71			
Line dec status								72			

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Keyp.	Access via RS	Term	D/P	Custom. values
Line fstp status								73			
Speed match								74			
Diam inc/dec En								75			
Wind/unwind								76			
Diam preset sel0								77			
Diam preset sel1								78			
Taper enable								79			
Speed demand En								80			
Winder side								81			
Enable PI-PD PID								82			
Jog TW enable								83			
Brake fbk								84			
Setup1/Setup2								85			
Inversion in 1	1276	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital input 2	138	U16	0	83	OFF (0)		Yes	R/Z	-	-	
(Select like input 1)											
Inversion in 2	1277	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital input 3	139	U16	0	83	OFF (0)		Yes	R/Z	-	-	
(Select like input 1)											
Inversion in 3	1278	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital input 4	140	U16	0	83	OFF (0)		Yes	R/Z	-	-	
(Select like input 1)											
Inversion in 4	1279	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital input 5	141	U16	0	83	OFF (0)		Yes	R/Z	-	-	
(Select like input 1)											
Inversion in 5	1280	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital input 6	142	U16	0	83	OFF (0)		Yes	R/Z	-	-	
(Select like input 1)											
Inversion in 6	1281	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital input 7	143	U16	0	83	OFF (0)		Yes	R/Z	-	-	
(Select like input 1)											
Inversion in 7	1282	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Digital input 8	144	U16	0	83	OFF (0)		Yes	R/Z	-	-	
(Select like input 1)											
Inversion in 8	1283	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
I/O CONFIG \ Encoder inputs											
Select enc 1	1020	U16	0	5	OFF		Yes	R/Z	-	-	
OFF					(0)			0			
Speed ref 1								2			
Speed ref 2								3			
Ramp ref 1								4			
Ramp ref 2								5			
Select enc 2	1021	U16	0	5	OFF		Yes	R/Z	-	-	
OFF					0			0			
Speed ref 1								2			
Speed ref 2								3			

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
Ramp ref 1								4			
Ramp ref 2								5			
Encoder 1 pulses	416	Float*	600	9999	1024		Yes	R/Z	-	R	
Encoder 2 pulses	169	Float*	150	9999	1024		Yes	R/Z	-	R	
Refresh enc 1	649	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Refresh enc 2	652	U16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
ADD SPEED FUNCT											
Auto capture	388	U16			OFF	(E)	Yes	R/W	ID	-	
ON								1	H		
OFF					0			0	L		
ADD SPEED FUNCT \ Adaptive spd reg											
Enable spd adap	181	U16	0	1	Disabled	(C)	Yes	R/Z	-	-	
Enabled								1			
Disabled					(0)			0			
Select adap type	182	U16	0	1	Speed		Yes	R/Z	-	-	
Adap reference								1			
Speed								0			
Adap reference	183	I16	-32768	+32767	1000		Yes	R/W	IA	R/W	
Adap speed 1 [%]	184	Float	0.0	200.0	20.3		Yes	R/W	-	-	
Adap speed 2 [%]	185	Float	0.0	200.0	40.7		Yes	R/W	-	-	
Adap joint 1 [%]	186	Float	0.0	200.0	6.1		Yes	R/W	-	-	
Adap joint 2 [%]	187	Float	0.0	200.0	6.1		Yes	R/W	-	-	
Adap P gain 1 [%]	188	Float	0.00	100.00	10.00		Yes	R/W	-	-	
Adap I gain 1 [%]	189	Float	0.00	100.00	1.00		Yes	R/W	-	-	
Adap P gain 2 [%]	190	Float	0.00	100.00	10.00		Yes	R/W	-	-	
Adap I gain 2 [%]	191	Float	0.00	100.00	1.00		Yes	R/W	-	-	
Adap P gain 3 [%]	192	Float	0.00	100.00	10.00		Yes	R/W	-	-	
Adap I gain 3 [%]	193	Float	0.00	100.00	1.00		Yes	R/W	-	-	
ADD SPEED FUNCT \ Speed control											
Spd threshold +	101	U16	1	32767	1000		Yes	R/W	-	-	
Spd threshold -	102	U16	1	32767	1000		Yes	R/W	-	-	
Threshold delay [ms]	103	U16	0	65535	100		Yes	R/W	-	-	
Spd threshold	393	U16	0	1		Dig. Output 3	-	R	QD	R	
Speed not exceeded						(D)		1	H	1	
Speed exceeded								0	L	0	
Set error	104	U16	1	32767	100		Yes	R/W	-	-	
Set delay [ms]	105	U16	1	65535	100		Yes	R/W	-	-	
Set speed	394	U16	0	1		(D)	-	R	QD	R	
Speed = ref. val.								1	H	1	
Speed not ref. val.								0	L	0	
ADD SPEED FUNCT \ Speed zero											
Speed zero level	107	U16	1	32767	10		Yes	R/W	-	-	
Speed zero delay [ms]	108	U16	0	65535	100		Yes	R/W	-	-	
Speed zero thr	395	U16	0	1		(D)	-	R	QD	R	
Drive rotating								1	H	1	
Drive not rotating								0	L	0	
FUNCTIONS \ Double setup											
Copy setup	1350	U16	0	1	Setup1		Yes	R/Z	-	-	
Setup1					(0)			0			
Setup2								1			
Load setup	1351	U16	0	1	Setup1		Yes	R/Z	ID	-	
Setup1					(0)			0			
Setup2								1			
Actual setup	1352	U16	0	2	Not selected		Yes	R	-	-	
Not selected					(0)			0			
Setup1								1			

8.1 List of parameters and menus

Parameter	No.	Format	Value			Standard Configurat.	Access via				Custom. values
			min	max	Factory		Keyp.	RS	Term	D/P	
Setup2								2			
FUNCTIONS \ Motor pot											
Enable motor pot	246	I16	0	1	Disabled		Yes	R/Z	-	-	
Enabled								1			
Disabled					(0)			0			
Motor pot oper	247						Yes	-	-	-	
Motor pot sign	248	I16	0	1	Positive	(G)	Yes	R/W	ID	-	
Positive					(1)			1			
Negative								0			
Motor pot reset	249	U16				(E)	Yes	Z/C(1)	ID (H)	-	
Motor pot up	396	U16	0	1		(E)		R/W	ID	R/W	
Acceleration								1	H	1	
No acceleration								0	L	0	
Motor pot down	397	U16	0	1		(E)		R/W	ID	R/W	
Deceleration								1	H	1	
No deceleration								0	L	0	
FUNCTIONS \ Jog function											
Enable jog	244	I16	0	1	Disabled		Yes	R/Z	-	-	
Enabled								1			
Disabled					(0)			0			
Jog operation	265	-	-	-	-		Yes	-	-	-	
Jog selection	375	U16	0	1	0		Yes	R/Z	-	-	
Ramp input								1			
Speed input								0			
Jog reference	266	I16	0	32767	0	(C)	Yes	R/W	IA	-	
Jog +	398	U16	0	1		(E)		R/W	ID	R/W	
Forwards jog								1	H	1	
No jog forwards								0	L	0	
Jog -	399	U16	0	1		(E)		R/W	ID	R/W	
Backwards jog								1	H	1	
No backwards jog								0	L	0	
FUNCTIONS \ Multi speed fct											
Enab multi spd	153	I16	0	1	Disabled		Yes	R/Z	-	-	
Enabled								1			
Disabled					(0)			0			
Multi speed 1	154	I16	-32768	+32767	0		Yes	R/W	-	-	
Multi speed 2	155	I16	-32768	+32767	0		Yes	R/W	-	-	
Multi speed 3	156	I16	-32768	+32767	0		Yes	R/W	-	-	
Multi speed 4	157	I16	-32768	+32767	0		Yes	R/W	-	-	
Multi speed 5	158	I16	-32768	+32767	0		Yes	R/W	-	-	
Multi speed 6	159	I16	-32768	+32767	0		Yes	R/W	-	-	
Multi speed 7	160	I16	-32768	+32767	0		Yes	R/W	-	-	
Speed sel 0	400	U16	0	1		Dig. input 5	-	R/W	ID	R/W	
Value 2^0 selected						(E)		1	H	1	
Value 2^0 not selected								0	L	0	
Speed sel 1	401	U16	0	1		Dig. input 6	-	R/W	ID	R/W	
Value 2^1 selected						(E)		1	H	1	
Value 2^1 not selected								0	L	0	
Speed sel 2	402	U16	0	1		Dig. input 7	-	R/W	ID	R/W	
Value 2^2 selected						(E)		1	H	1	
Value 2^2 not selected								0	L	0	
Multispeed sel	208	U16	0	7	0		Yes	R/W	ID	R/W	
FUNCTIONS \ Multi ramp fct											
Enab multi rmp	243	I16	0	1	Disabled		Yes	R/Z	-	-	
Enabled								1			
Disabled					(0)			0			
Ramp selector	202	U16	0	3	0		Yes	R/W	ID	R/W	
FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0											
Acc delta speed0	659	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Acc delta time 0 [s]	660	U16	0	65535	1		Yes	R/W	-	-	

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
S acc t const 0 [ms]	665	Float	100	3000	300		Yes	R/W	-	-	
FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0											
Dec delta speed0	661	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Dec delta time 0 [s]	662	U16	0	65535	1		Yes	R/W	-	-	
S dec t const 0 [ms]	666	Float	100	3000	300		Yes	R/W	-	-	
FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1											
Acc delta speed1	23	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Acc delta time 1 [s]	24	U16	0	65535	1		Yes	R/W	-	-	
S acc t const 1 [ms]	667	Float	100	3000	300		Yes	R/W	-	-	
FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1											
Dec delta speed1	31	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Dec delta time 1 [s]	32	U16	0	65535	1		Yes	R/W	-	-	
S dec t const 1 [ms]	668	Float	100	3000	300		Yes	R/W	-	-	
FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2											
Acc delta speed2	25	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Acc delta time 2 [s]	26	U16	0	65535	1		Yes	R/W	-	-	
S acc t const 2 [ms]	669	Float	100	3000	300		Yes	R/W	-	-	
FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2											
Dec delta speed2	33	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Dec delta time 2 [s]	34	U16	0	65535	1		Yes	R/W	-	-	
S dec t const 2 [ms]	670	Float	100	3000	300		Yes	R/W	-	-	
FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3											
Acc delta speed3	27	U32	0	2^{32}-1	100		Yes	R/W	-	-	
Acc delta time 3 [s]	28	U16	0	65535	1		Yes	R/W	-	-	
S acc t const 3 [ms]	671	Float	100	3000	300		Yes	R/W	-	-	
FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3											
Dec delta speed3	35	U32	0	232-1	100		Yes	R/W	-	-	
Dec delta time 3 [s]	36	U16	0	65535	1		Yes	R/W	-	-	
S dec t const 3 [ms]	672	Float	100	3000	300		Yes	R/W	-	-	
Ramp sel 0 Value 2^0 selected Value 2^0 not selected	403	U16	0	1		(E)	-	R/W 1 0	ID H L	R/W 1 0	
Ramp sel 1 Value 2^1 selected Value 2^1 not selected	404	U16	0	1		(E)	-	R/W 1 0	ID H L	R/W 1 0	
FUNCTIONS \ Speed draw											
Speed ratio	1017	I16	0	+32767	+10000	(C)	Yes	R/W	IA	R/W	
Speed draw out (d)	1018	I16	-32768	+32767	-	(A)	Yes	R	QA	R/W	
Speed draw out (%)	1019	Float	-200.0	+200.0	-		Yes	R	-	-	
FUNCTIONS \ Overload contr											
Enable overload Enabled Disabled	309	I16	0	1	Disabled (0)		Yes	R/Z 1 0	-	-	
Overload mode Curr limited Curr not limited I2t	318	U16	0	1	Curr limited (0)		Yes	R/W 0 1 2	-	-	
Overload current [%]	312	U16	P313	200	100		Yes	R/W	-	-	
Base current [%]	313	U16	0	P312 $\leq$ 100	80		Yes	R/W	-	-	
Overload time [s]	310	U16	0	65535	30		Yes	R/W	-	-	
Ovrld prealarm	1289	U16	0	1	-		Yes	R	-	-	
I2t accumulator	655	Float	0	100.00%	-		Yes	R	-	-	
Pause time [s]	311	U16	0	65535	300		Yes	R/W	-	-	
Overld available Overload possible Overload not possible	406	U16	0	1		Dig. Output 4 (D)	-	R 1 0	QD H L	R 1 0	
Overload state	407	U16	0	1		(D)	-	R	QD	R	

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Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
Current > limit value								1	H	1	
Current limit value								0	L	0	
FUNCTIONS \ Brake control											
Enable Torque pr	1295	I16	0	1	Disabled		Yes	R/W	-	-	
Enabled								1			
Disabled					(0)			0			
Closing speed	1262	U16	0	200	30		Yes	R/W	-	-	
Torque delay	1293	I16	0	30000	3000		Yes	R/W			
Torque proving	1294	I16	0	200	75		Yes	R/W			
Min Trq proving	1368	I16	0	50	5		Yes	R/W			
Actuator delay	1266	U16	0	30000	1000		Yes	R/W	-	-	
FUNCTIONS \ Stop control											
Stop mode	626	U16	0	3	Stop & Speed 0	(D)	Yes	R/Z	-	-	
OFF						Relay 75/76		0			
Stop & speed 0								1			
Fast stp & spd 0								2			
Fst / stp & spd 0								3			
Spd 0 trip delay [ms]	627	U16	0	40000	0		Yes	R/W	-	-	
Trip cont delay [ms]	628	U16	0	40000	0		Yes	R/W	-	-	
Jog stop control	630	U16	0	1	OFF		Yes	R/Z	-	-	
ON								1			
OFF					(0)			0			
FUNCTIONS \ I/n curve											
I/n curve	750	U16	0	1	Disabled		Yes	R/Z	-	-	
Enabled								1			
Disabled					(0)			0			
I/n lim 0 [%]	751	U16	0	200	0		Yes	R/Z	-	-	
I/n lim 1 [%]	752	U16	0	200	0		Yes	R/Z	-	-	
I/n lim 2 [%]	753	U16	0	200	0		Yes	R/Z	-	-	
I/n lim 3 [%]	754	U16	0	200	0		Yes	R/Z	-	-	
I/n lim 4 [%]	755	U16	0	200	0		Yes	R/Z	-	-	
I/n speed [rpm]	756	U16	0	P162	0		Yes	R/Z	-	-	
SPEC FUNCTIONS \ Test generator											
Generator access	58	U16	0	5	Not conn.		Yes	R/Z	-	-	
Not connected								0			
T current ref								2			
Flux ref								3			
Ramp ref								4			
Speed ref								5			
Gen frequency [Hz]	59	Float	0.1	62.5	0.1		Yes	R/W	-	-	
Gen amplitude [%]	60	Float	0	200.00	0		Yes	R/W	-	-	
Generator offset [%]	61	Float	-200.00	+200.00	0		Yes	R/W	-	-	
SPEC FUNCTIONS											
Save parameters	256	U16					Yes	C/W(1)	-	-	
Load default	258	U16					Yes	Z/C(1)	-	-	
Life time [h.min]	235	Float	0	65535			Yes	R	-	-	
Failure register	330	U16	1	10	10		Yes	R/W	-	-	
Failure text	327	Text					-	R	-	-	
Failure hour	328	U16	0	65535				R	-	-	
Failure minute	329	U16	0	59				R	-	-	
Failure code	417	U16	0	65535				R	-	-	
Failure supply								5100h			
Undervoltage								3120h			
Overvoltage								3310h			
Overcurrent								2300h			
Heatsink								4210h			
Hardware								5000h			
DSP error								6110h			
Interrupt error								6120h			
Speed fbk								7301h			
External fault								9000h			

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Parameter	No.	Format	Value			Standard Configurat.	Access via				Custom. values
			min	max	Factory		Keyp.	RS	Term	D/P	
Overtemp motor								4310h			
Field loss								3330h			
Bus loss								8110h			
Hw opt 1 failure								7510h			
Opt2								7400h			
Unknown								1001h			
Enable seq err								9009h			
Brake error								9090h			
I2t ovrld error								7120h			
Failure reset	262	U16					Yes	Z/C (1)	ID (H)	W	
Failure reg del	263	U16					Yes	C	-	-	
SPEC FUNCTIONS \ Links \ Link 1											
Source	484	U16	0	65535	0		Yes	R/W	-	-	
Destination	485	U16	0	65535	0		Yes	R/W	-	-	
Mul gain	486	Float	-10000	+10000	1		Yes	R/W	-	-	
Div gain	487	Float	-10000	+10000	1		Yes	R/W	-	-	
Input max	488	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input min	489	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input offset	490	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Output offset	491	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Inp absolute	492	U16	0	1	OFF		Yes	R/W	-	-	
ON								1			
OFF					(0)			0			
SPEC FUNCTIONS \ Links \ Link 2											
Source	553	U16	0	65535	0		Yes	R/W	-	-	
Destination	554	U16	0	65535	0		Yes	R/W	-	-	
Mul gain	555	Float	-10000	+10000	1		Yes	R/W	-	-	
Div gain	556	Float	-10000	+10000	1		Yes	R/W	-	-	
Input max	557	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input min	558	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input offset	559	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Output offset	560	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Inp absolute	561	U16	0	1	OFF		Yes	R/W	-	-	
ON								1			
OFF					(0)			0			
SPEC FUNCTIONS \ Links \ Link 3											
Source	1218	U16	0	65535	0		Yes	R/W	-	-	
Destination	1219	U16	0	65535	0		Yes	R/W	-	-	
Mul gain	1220	Float	-10000	+10000	1		Yes	R/W	-	-	
Div gain	1221	Float	-10000	+10000	1		Yes	R/W	-	-	
Input max	1222	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input min	1223	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input offset	1224	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Output offset	1225	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Inp absolute	1226	U16	0	1	OFF		Yes	R/W	-	-	
ON								1			
OFF					(0)			0			
SPEC FUNCTIONS \ Links \ Link 4											
Source	1227	U16	0	65535	0		Yes	R/W	-	-	
Destination	1228	U16	0	65535	0		Yes	R/W	-	-	
Mul gain	1229	Float	-10000	+10000	1		Yes	R/W	-	-	
Div gain	1230	Float	-10000	+10000	1		Yes	R/W	-	-	
Input max	1231	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input min	1232	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input offset	1233	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Output offset	1234	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Inp absolute	1235	U16	0	1	OFF		Yes	R/W	-	-	
ON								1			

8.1 List of parameters and menus

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
OFF					(0)			0			
SPEC FUNCTIONS \ Links \ Link 5											
Source	1236	U16	0	65535	0		Yes	R/W	-	-	
Destination	1237	U16	0	65535	0		Yes	R/W	-	-	
Mul gain	1238	Float	-10000	+10000	1		Yes	R/W	-	-	
Div gain	1239	Float	-10000	+10000	1		Yes	R/W	-	-	
Input max	1240	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input min	1241	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input offset	1242	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Output offset	1243	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Inp absolute	1244	U16	0	1	OFF		Yes	R/W	-	-	
ON								1			
OFF					(0)			0			
SPEC FUNCTIONS \ Links \ Link 6											
Source	1245	U16	0	65535	0		Yes	R/W	-	-	
Destination	1246	U16	0	65535	0		Yes	R/W	-	-	
Mul gain	1247	Float	-10000	+10000	1		Yes	R/W	-	-	
Div gain	1248	Float	-10000	+10000	1		Yes	R/W	-	-	
Input max	1249	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input min	1250	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Input offset	1251	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Output offset	1252	Float	-2^{31}	$2^{31}-1$	0		Yes	R/W	-	-	
Inp absolute	1253	U16	0	1	OFF		Yes	R/W	-	-	
ON								1			
OFF					(0)			0			
SPEC FUNCTIONS \ Pad Parameters											
Pad 0	503	I16	-32768	+32767	0	(A), (C)	Yes	R/W	IA, QA	R/W	
Pad 1	504	I16	-32768	+32767	0	(A), (C)	Yes	R/W	IA, QA	R/W	
Pad 2	505	I16	-32768	+32767	0	(C)	Yes	R/W	IA	R/W	
Pad 3	506	I16	-32768	+32767	0	(C)	Yes	R/W	IA	R/W	
Pad 4	507	I16	-32768	+32767	0	(A)	Yes	R/W	QA	R/W	
Pad 5	508	I16	-32768	+32767	0	(A)	Yes	R/W	QA	R/W	
Pad 6	509	I16	-32768	+32767	0	(A)	Yes	R/W	QA	R/W	
Pad 7	510	I16	-32768	+32767	0		Yes	R/W	-	R/W	
Pad 8	511	I16	-32768	+32767	0		Yes	R/W	-	R/W	
Pad 9	512	I16	-32768	+32767	0		Yes	R/W	-	R/W	
Pad 10	513	I16	-32768	+32767	0		Yes	R/W	-	R/W	
Pad 11	514	I16	-32768	+32767	0		Yes	R/W	-	R/W	
Pad 12	515	I16	-32768	+32767	0		Yes	R/W	-	R/W	
Pad 13	516	I16	-32768	+32767	0		Yes	R/W	-	R/W	
Pad 14	517	I16	-32768	+32767	0		Yes	R/W	-	R/W	
Pad 15	518	I16	-32768	+32767	0		Yes	R/W	-	R/W	
Bitword pad A	519	U16	0	65535	0	(E), (D)	Yes	R/W	ID*,	R/W	
Pad A Bit 0	520	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W	
Pad A Bit 1	521	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W	
Pad A Bit 2	522	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W	
Pad A Bit 3	523	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W	
Pad A Bit 4	524	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W	
Pad A Bit 5	525	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W	
Pad A Bit 6	526	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W	
Pad A Bit 7	527	U16	0	1	0	(E), (D)	-	R/W	ID, QD	R/W	
Pad A Bit 8	528	U16	0	1	0		-	R/W	QD*	-	
Pad A Bit 9	529	U16	0	1	0		-	R/W	QD*	-	
Pad A Bit 10	530	U16	0	1	0		-	R/W	QD*	-	
Pad A Bit 11	531	U16	0	1	0		-	R/W	QD*	-	
Pad A Bit 12	532	U16	0	1	0		-	R/W	QD*	-	
Pad A Bit 13	533	U16	0	1	0		-	R/W	QD*	-	
Pad A Bit 14	534	U16	0	1	0	(H)	-	R/W	QD*	-	
Pad A Bit 15	535	U16	0	1	0		-	R/W	QD*	-	

8.1 List of parameters and menus

Parameter	No.	Format	Value			Standard Configurat.	Access via				Custom. values
			min	max	Factory		Keyp.	RS	Term	D/P	
Bitword pad B	536	U16	0	65535	0	(D)	Yes	R/W	QD*	R/W	
Pad B Bit 0	537	U16	0	1	0	(D)	-	R/W	QD	R	
Pad B Bit 1	538	U16	0	1	0	(D)	-	R/W	QD	R	
Pad B Bit 2	539	U16	0	1	0	(D)	-	R/W	QD	R	
Pad B Bit 3	540	U16	0	1	0	(D)	-	R/W	QD	R	
Pad B Bit 4	541	U16	0	1	0	(D)	-	R/W	QD	R	
Pad B Bit 5	542	U16	0	1	0	(D)	-	R/W	QD	R	
Pad B Bit 6	543	U16	0	1	0	(D)	-	R/W	QD	R	
Pad B Bit 7	544	U16	0	1	0	(D)	-	R/W	QD	R	
Pad B Bit 8	545	U16	0	1	0		-	R/W	QD*	-	
Pad B Bit 9	546	U16	0	1	0		-	R/W	QD*	-	
Pad B Bit 10	547	U16	0	1	0		-	R/W	QD*	-	
Pad B Bit 11	548	U16	0	1	0		-	R/W	QD*	-	
Pad B Bit 12	549	U16	0	1	0		-	R/W	QD*	-	
Pad B Bit 13	550	U16	0	1	0		-	R/W	QD*	-	
Pad B Bit 14	551	U16	0	1	0	(H)	-	R/W	QD*	-	
Pad B Bit 15	552	U16	0	1	0		-	R/W	QD*	-	
OPTIONS \ Option 1											
	Accessible only with optional DCVS5Z27 CANopen card										
OPTIONS \ Option 2											
Menu	Accessible only with optional DCVS5W04 card										
Enable OPT2	425	U16	0	1	Disabled		Yes	R/Z	-	-	
Enabled								1			
Disabled					(0)			0			
OPTIONS \ PID											
Enable PI PID	769	U16	0	1	Disabled	(E)	Yes	R/W	ID	R/W	
Enabled								1			
Disabled					(0)			0			
Enable PD PID	770	U16	0	1	Disabled	(E)	Yes	R/W	ID	R/W	
Enabled								1			
Disabled					0			0			
Enable PI-PD PID	1258	U16	0	1	Disabled		-	R/W	ID	R/W	
Enabled								1			
Disabled					(0)			0			
OPTIONS \ PID \ PID source											
PID source	786	U16	0	65535	0		Yes	R/W	-	-	
PID source gain	787	Float	-100.000	+100.00	1.000		Yes	R/W	-	-	
Feed-fwd PID	758	I16	-10000	+10000	0	(C)	Yes	R	IA	R	
OPTIONS \ PID \ PID references											
PID error	759	I16	-10000	+10000	0		Yes	R	-	R	
Act tension ref	1194	Float	0.00	200.00	0		Yes	R	-	R	
PID feed-back	763	I16	-10000	+10000	0	(C)	Yes	R/W	IA	R/W	
PID offs. Sel	762	U16	0	1	0	(E)	Yes	R/W	ID	R/W	
Offset 1								1			
Offset 0								0			
PID offset 0	760	I16	-10000	+10000	0	(C)	Yes	R/W	IA	R/W	
PID offset 1	761	I16	-10000	+10000	0		Yes	R/W	-	-	
PID acc time	1046	Float	0.0	900.0	0.0		Yes	R/W	-	-	
PID dec time	1047	Float	0.0	900.0	0.0		Yes	R/W	-	-	
PID err gain [%]	1254	Float	0.00	32.00	1		Yes	R/W	-	-	
PID clamp	757	I16	-10000	+10000	10000		Yes	R/W	-	-	
OPTIONS \ PID \ PI controls											
PI P gain PID	765	Float	0.00	100.00	10.00		Yes	R/W	-	-	
PI I gain PID	764	Float	0.00	100.00	10.00		Yes	R/W	-	-	
PI steady thr	695	I16	0	10000	0		Yes	R/W	-	-	
PID steady delay	731	U16	0	60000	0		Yes	R/W	-	-	
P init gain PID	793	Float	0.00	100.00	10.00		Yes	R/W	-	-	
I init gain PID	734	Float	0.00	100.00	10.00		Yes	R/W	-	-	
PI central v sel	779	U16	0	3	1	(E)	Yes	R/W	ID	R/W	

8 - List of parameters

8.1 List of parameters and menus

Parameter	No.	Format	Value			Standard Configurat.	Access via				Custom. values
			min	max	Factory		Keyp.	RS	Term	D/P	
PI central v1	776	Float	PI bot lim	PI toplim	1.00		Yes	R/W	-	-	
PI central v2	777	Float	PI bot lim	PI toplim	1.00		Yes	R/W	-	-	
PI central v3	778	Float	PI bot lim	PI toplim	1.00	(C)	Yes	R/W	IA	-	
PI top lim	784	Float	PI bot lim	10.00	10.00		Yes	R/W	-	-	
PI bottom lim	785	Float	-10.00	PI toplim	0.00		Yes	R/W	-	-	
PI integr freeze ON OFF	783	U16	0	1	OFF (0)	(E)	Yes	R/W 1 0	ID	R/W	
PI output PID	771	I16	0	1000 x PI toplim	1000		Yes	R	-	R	
Real FF PID	418	I16	-10000	+10000	0		Yes	R/W	-	R	
OPTIONS \ PID \ PD control											
PD P gain 1 PID [%]	768	Float	0.00	100.00	10.00		Yes	R/W	-	-	
PD D gain 1 PID [%]	766	Float	0.00	100.00	1.00		Yes	R/W	-	-	
PD P gain 2 PID [%]	788	Float	0.00	100.00	10.00		Yes	R/W	-	-	
PD D gain 2 PID [%]	789	Float	0.00	100.00	1.00		Yes	R/W	-	-	
PD P gain 3 PID [%]	790	Float	0.00	100.00	10.00		Yes	R/W	-	-	
PD D gain 3 PID[%]	791	Float	0.00	100.00	1.00		Yes	R/W	-	-	
PD D filter PID [ms]	767	U16	0	1000	0		Yes	R/W	-	-	
PD output PID	421	I16	-10000	+10000	0		Yes	R	-	-	
PID out sign PID Bipolar Positive	772	U16	0	1	Bipolar (1)		Yes	R/W 1 0	-	-	
PID output	774	I16	-10000	+10000	0	(A)	Yes	R	QA	R	
OPTIONS \ PID \ PID target											
PID target	782	U16	0	65535	0		Yes	R/W	-	-	
PID out scale	773	Float	-100.000	+100.000	1.000		Yes	R/W	-	-	
OPTIONS \ PID \ Diameter calc											
Diameter calc Enabled Disabled	794	U16	0	1	Disabled 0	(E)	Yes	Z/R 1 0	ID	R/W	
Positioning spd [rpm]	795	I16	-100	100	0		Yes	R/W	-	-	
Max deviation	796	I16	-10000	+10000	8000		Yes	R/W	-	-	
Gear box ratio	797	Float	0.001	1.000	1.000		Yes	R/W	-	-	
Dancer constant [mm]	798	U16	1	10000	1		Yes	R/W	-	-	
Minimum diameter [cm]	799	U16	1	2000	1		Yes	R/W	-	-	
OPTIONS \ PID											
PI central vs0	780	U16	0	1	1	(D)	-	R/W	ID	R/W	
PI central vs1	781	U16	0	1	0		-	R/W	ID	R/W	
Diameter calc st	800	U16	0	1	0		-	R	QD	R	
OPTIONS \ TORQUE WINDER											
Torque winder En Enabled Disabled	1209	U16	0	1	Disabled (0)		Yes	R/W 1 0	ID	R/W	
OPTIONS \ TORQUE WINDER \ Diam Calculatio											
Roll diameter [m]	1154	Float	0.000	32.000		(A)	Yes	R	QA	-	
Line speed [%]	1160	Float	0.00	200.00			Yes	R	-	-	
Ref line speed [%]	1286	Float	0.00	200.00			Yes	R	-	-	
Diam calc Dis ON OFF	1161	U16	0	1	ON (1)	(E)	Yes	R/W 1 0	ID	R/W	
Diam inc/dec En Enabled Disabled	1205	U16	0	1	Enabled (0)	(E)	Yes	R/W 1 0	ID	R/W	
Wind/unwind Unwinder Winder	1187	U16	0	1	Winder (0)	(E)	Yes	R/W 1 0	ID	R/W	
Minimum diameter [mm]	799	U16	1	2000	100		Yes	R/Z	-	-	
Maximum diameter [m]	1153	Float	0.000	32.000	1000		Yes	R/Z	-	-	

8.1 List of parameters and menus

Parameter	No.	Format	Value			Standard Configurat.	Access via				Custom. values
			min	max	Factory		Keyp.	RS	Term	D/P	
Line spd source	1204	U16	0	65535	0		Yes	R/Z	-	-	
Ref spd source	1284	U16	0	65535	0		Yes	R/Z	-	-	
Line speed gain	1156	I16	0	32767	0		Yes	R/W	-	-	
Ref speed gain	1285	I16	0	32767	0		Yes	R/W	-	-	
Base omega [rpm]	1163	U16	0	8191	1500		Yes	R/W	-	-	
Ref speed thr [%]	1155	Float	0	150.00	5		Yes	R/W	-	-	
Diam filter [ms]	1162	U16	0	5000	100		Yes	R/W	-	-	
Diam init filter [ms]	1206	U16	0	5000	100		Yes	R/W	-	-	
Diam stdy delay [ms]	1207	U16	0	60000	0		Yes	R/W	-	-	
Diam reset	1157	U16	0	1	0	(E)	Yes	R/W	ID	R/W	
Diam thr [%]	1158	Float	0	150.00	10		Yes	R/W	-	-	
Diam reached	1159	U16	0	1		(D)	Yes	R	QD	R	
Diam preset sel	1168	U16	0	3	0	(E)	Yes	R/W	ID	-	
Diam preset 0 [m]	1164	Float	0.000	32.000	0		Yes	R/W	-	-	
Diam preset 1 [m]	1165	Float	0.000	32.000	0		Yes	R/W	-	-	
Diam preset 2 [m]	1166	Float	0.000	32.000	0		Yes	R/W	-	-	
Diam preset 3 [m]	1167	Float	0.000	32.000	0	(C)	Yes	R/W	IA	-	
OPTIONS \ TORQUE WINDER \ Torque calculat											
Tension ref [%]	1180	Float	0.00	199.99	0	(C)	Yes	R/W	IA	-	
Tension scale [%]	1181	I16	0	200	100		Yes	R/W	-	-	
Act tension ref [%]	1194	Float	0.00	199.99			Yes	R	-	-	
Torque current [%]	1193	Float	0.00	200.00		(A)	Yes	R	QA	-	
OPTIONS \ TORQUE WINDER \ Torque calculat \ Comp calculat											
Int acc calc En Enabled Disabled	1183	U16	0	1	Enabled (1)	(E)	Yes	R/Z 1 0	-	-	
Time acc/dec min [s]	1182	Float	0.15	300.00	9.01		Yes	R/W	-	-	
Acc/dec filter [ms]	1212	U16	0	5000	30		Yes	R/W	-	-	
Line acc [%]	1184	Float	0.00	100.00	100		Yes	R/W	-	-	
Line dec [%]	1185	Float	0.00	100.00	100		Yes	R/W	-	-	
Line fast stop [%]	1186	Float	0.00	100.00	100		Yes	R/W	-	-	
Line acc status	1188	U16	0	1	OFF	(E)	Yes	R/W	ID	R/W	
Line dec status	1189	U16	0	1	OFF	(E)	Yes	R/W	ID	R/W	
Line fstp status	1190	U16	0	1	OFF	(E)	Yes	R/W	ID	R/W	
Variable J comp [%]	1171	Float	0.00	199.99	0		Yes	R/W	-	-	
Constant J comp [%]	1172	Float	-100.00	+100.00	0		Yes	R/W	-	-	
Act var J comp [%]	1192	Float	-	200.00	0		Yes	R	-	-	
Act const J comp [%]	1191	Float	-	200.00	0		Yes	R	-	-	
Mat width [%]	1173	Float	0.00	100.00	100		Yes	R/W	-	-	
Static f [%]	1174	Float	0.00	199.99	0		Yes	R/W	-	-	
Dinamic f [%]	1175	Float	0.00	199.99	0		Yes	R/W	-	-	
Static f Zero Enabled Disabled	1287	U16	0	1	Disabled (0)		Yes	R/W 1 0	-	-	
Actual comp [%]	1213	I16	-200	+200			Yes	R	QD	-	
Closed loop En Enabled Disabled	1214	U16	0	1	Disabled (0)		Yes	R/Z 1 0	-	R/Z	
Close loop comp	1208	I16	-32767	+32767			Yes	R	-	-	
OPTIONS \ TORQUE WINDER \ Torque calculat \ Taper function											
Taper enable Enabled Disabled	1176	U16	0	1	Disabled (0)	(E)	Yes	R/W 1 0	ID	R/W	
Init diameter [m]	1177	Float	0.000	32.000	0.1		Yes	R/W	-	-	
Final diameter [m]	1178	Float	0.000	32.000	1		Yes	R/W	-	-	
Tension ref [%]	1180	Float	0.00	199.99	0	(C)	Yes	R/W	IA	-	
Tension red [%]	1179	Float	0.00	199.99	0	(C)	Yes	R/W	IA	-	
Act tension ref [%]	1194	Float	0.00	200.00	0	(A)	Yes	R	QA	-	
OPTIONS \ TORQUE WINDER \ Speed demand											
Speed demand En	1215	U16	0	1	Disabled		Yes	R/W	-	R/W	

8.1 List of parameters and menus

Parameter	No.	Format	Value min	Value max	Value Factory	Standard Configurat.	Access via Keyp.	Access via RS	Access via Term	Access via D/P	Custom. values
Enabled Disabled					 (0)			1 0			
Winder side Down Up	1201	U16	0	1	Up (0)	(E)	Yes	R/W 1 0	ID	R/W	
W gain [%]	1202	U16	0	100	0		Yes	R/W	-	-	
Speed match ON OFF	1195	U16	0	1	OFF (0)	(E)	Yes	R/W 1 0	ID	R/W	
Spd match gain [%]	1200	U16	0	150	100		Yes	R/W	-	-	
Spd match acc [s]	1196	Float	0.30	300.00	83.88		Yes	R/W	-	-	
Spd match dec [s]	1197	Float	0.30	300.00	83.88		Yes	R/W	-	-	
Spd match compl	1203	U16	0	1		(D)	Yes	R	QD	R	
Spd match torque [%]	1216	U16	0	200	100		Yes	R/W	-	-	
W offset [rpm]	1199	I16	0	1000	0		Yes	R/W	-	-	
Offset acc time [s]	1198	Float	0.30	950.00	83.88		Yes	R/W	-	-	
W target	1210	U16	0	65535	0		Yes	R/Z	-	-	
W reference [rpm]	1217	I16	-8192	+8192		(A)	Yes	R	QA	-	
Jog TW enable Enabled Disabled	1256	U16	0	1	Disabled (0)	(E)	Yes	R/W 1 0	ID	R/W	
Jog TW speed [%]	1255	I16	0	100	0		Yes	R/W	-	-	
SERVICE											
Password 2	86										

8.2 List of high-priority parameters

When a development and programming board for DCVS5W04 applications is used, the following variable parameters may be exchanged at high speed with the option board (Automatic synchronous communication). For more information see the technical documentation for the board.

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
T current lim + [%]	8	U16	0	200	100	(E)	Yes	R/W	IA	R/W
T current lim - [%]	9	U16	0	200	100	(E)	Yes	R/W	IA	R/W
In use Tcur lim+ [%]	10	U16	0	200			Yes	R	-	R
In use Tcur lim- [%]	11	U16	0	200			Yes	R	-	R
Current lim red [%]	13	U16	0	200	100		Yes	R/W	-	R/W
T current ref 1 [%]	39	I16	-200	+200	0	Speed regulator output (C)	Yes	R/W	IA, QA	R/W
T current ref 2 [%]	40	I16	-200	+200	0	(C)	Yes	R/W	IA, QA	-
T current ref [%]	41	I16	-200	+200	-	(A)	Yes	R	QA	R
Speed ref 1	42	I16	-2 * P45	+2 * P45	0	Ramp output (C)	Yes	R/W	IA, QA	R/W
Speed ref 2	43	I16	-2 * P45	+2 * P45	0	(C)	Yes	R/W	IA, QA	R/W
Ramp ref 1	44	I16	-2 * P45	+2 * P45	0	Analog inp.1	Yes	R/W	IA, QA	R/W
Ramp ref 2	48	I16	-2 * P45	+2 * P45	0	(B)	Yes	R/W	IA, QA	R/W
Ramp ref (rpm)	110	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Ramp outp (rpm)	113	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Speed ref (rpm)	118	I16	-32768	+32767	-	(A)	Yes	R	QA	R
Actual spd (rpm)	122	I16	-8192	+8192	-		Yes	R	QA	R
Adap reference	183	I16	-32768	+32767	1000		Yes	R/W	IA	R/W
Speed reg output [%]	236	I16	-200	+200	-	T current ref (A)	Yes	R	QA	R
Lock speed reg ON OFF	322	U16	0	1	OFF (0)	(E)	Yes	R/W 1 0	ID H L	R/W 1 0
Flux current max [%]	467	U16	P468	100	100	(A), (C)	Yes	R/W	-	R/W
Flux reference [%]	500	Float	0.0	100.0	-	(A)	Yes	R	QA	-
Pad 0	503	I16	-32768	+32767	0	(A), (C)	Yes	R/W	IA, QA	R/W
Pad 1	504	I16	-32768	+32767	0	(A), (C)	Yes	R/W	IA, QA	R/W
Pad 2	505	I16	-32768	+32767	0	(C)	Yes	R/W	IA	R/W
Pad 3	506	I16	-32768	+32767	0	(C)	Yes	R/W	IA	R/W
Pad 4	507	I16	-32768	+32767	0	(A)	Yes	R/W	QA	R/W
Pad 5	508	I16	-32768	+32767	0	(A)	Yes	R/W	QA	R/W
Pad 6	509	I16	-32768	+32767	0	(A)	Yes	R/W	QA	R/W
Pad 7	510	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 8	511	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 9	512	I16	-32768	+32767	0		Yes	R/W	-	R/W

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8.2 List of high-priority parameters

Parameter	No.	Format	Value			Standard Configurat.	Access via			
			min	max	Factory		Keyp.	RS	Term	D/P
Pad 10	513	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 11	514	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 12	515	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 13	516	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 14	517	I16	-32768	+32767	0		Yes	R/W	-	R/W
Pad 15	518	I16	-32768	+32767	0		Yes	R/W	-	R/W
Bitword pad A	519	U16	0	65535	0	(E), (D)	Yes	R/W	ID*, QD*	R/W
Bitword pad B	536	U16	0	65535	0	(D)	Yes	R/W	QD*	R/W
Dig input term	564	U16	0	65535	-		-	R	-	R
Dig output term	581	U16	0	65535	-			R	-	R
Load comp [%]	698	I16	-200	+200	0	(C)	Yes	R/W	IA	R/W
Ind store ctrl	912	U16	0	65535	0		-	R/W	-	R/W
Index storing	913	U32	0	$+2^{32}-1$	0		-	R	-	R
Out vlt level	921	Float*	0	100.0	100.0	(A), (C)	Yes	R/W	IA, QA	R/W
F act spd (rpm)	924	I16	-32768	+32767	-	(A)	Yes	R	QA	R
F act spd (d)	925	I16	-32768	+32767	-	(A)	Yes	R	-	R
F T curr (%)	928	I16	-500	+500	-	(A)	Yes	R	QA	R
Speed ratio	1017	I16	0	+32767	+10000	(C)	Yes	R/W	IA	R/W
Speed draw out (d)	1018	I16	-32768	+32767	-	(A)	Yes	R	QA	R/W

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Note !

1) [**SPD**] Configuration of the speed expressed in rpm*4.

2) [**CURR**] Configuration of the current expressed as DC drive rated current/2000; 2000 is the value of **TOP_CURR**.

3) [**ENC_PLS**] Position of encoder expressed in *pulses * 4.*

4) [**ENC_TIM**] Last time (s) for the encoder expressed in 50ns per unit (1 = 50ns).

5) Encoder 2 parameters (indicated by * in the table) which can be read by the DCVS5W04 board only if the parameter **Speed fbk sel** = Encoder 2.

DCVNDOC100EN

Rev. 0.0 - 19-12-2012

1S4DCEN