

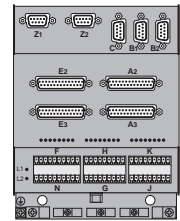
EcoController GEL 8150

- Coiling controller



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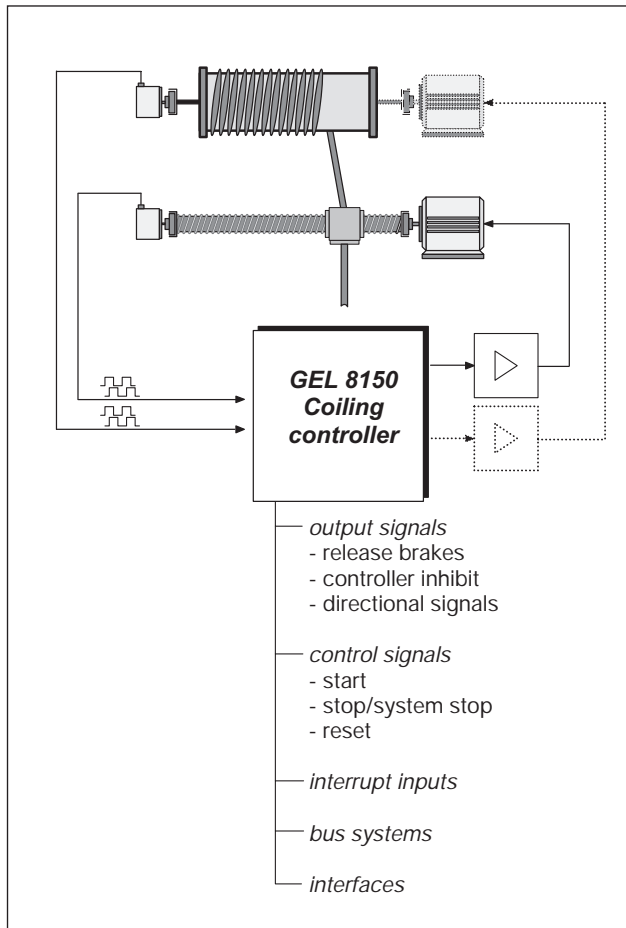
Design, construction



Design

The GEL 8150 material-winding controller is used to control the guidance of round- and flat-section material depending on the structure and parameters.

The instrument is designed to be installed in a switch cabinet and can be operated on its own or as part of a network. The heart of the controller hardware is a fast 16-bit microprocessor and a very powerful periphery ASIC specially developed to meet the demands encountered in motion automation. The housing is constructed of sheet steel.



Input/Outputs

In its basic form, the controller has the following features:

- digital inputs (terminal strip G, J)
- digital outputs (terminal strip H, K) and
- combined inputs/outputs (terminal strip F)

The following options are also available:

- 48 digital inputs (connectors E2 and E3) and
- 48 digital outputs (connectors A2 and A3).

All digital outputs operate at the 24 V usually used in industrial practice. All digital inputs/ outputs are short-circuit proof and are protected against polarity reversal. The switching states of the 24 inputs or 24 outputs can be displayed via 24 LEDs according to choice (programmable).

Actual value acquisition

The following options can be selected to record the actual positions of the core and support:

- counting input for 5 V or 24 V incremental encoder
- CAN bus

Actual-value acquisition via an SSI input in the Grey code (13 bit/ 25bit) is also available in the case of the support position. A multiplier may be introduced for the support and the core to match the detector to the controller.

Communication interfaces

The controller can easily be connected to a network by means of two parallel-switched, 9-pin D-subminiature connectors. The following are available:

- two RS 485 and one RS 422/485 communications interfaces independent of one another (connectors B1, B2)
- PROFIBUS DP (connector P₁ / P₂), described under section PROFIBUS DP
- one RS 232 interface and the CAN Bus (connector C)
- InterBus-S (connector I₁ / I₂)

PROFIBUS DP (Connector P₁ and P₂)

The controller communicates as a DP SLAVE to Class 1 and Class 2 DP masters and has the following services for cyclical data exchange: Global Control Commands, „Clear Data“, „Freeze“ and „Sync“, Read_Input and Read_Output, and the response monitor, Watchdog. The maximum transfer rate is 1.5 MBaud.

InterBus-S (Connector I₁ and I₂)

The controller operates as a data-highway station with InterBus-S slave functionality for communicating with a bus master. The InterBus-S can take the place of all parallel, digital inputs and digital outputs. Process data can also be read and written via the process-data channel. The PROFIBUS or the InterBus-S can be set up instead of the data input/output module.



Programming, operation

Programming

A controller program always contains the set-point values necessary for guiding the winding process. The basic program contains the following set points:

- start of coil
- end of coil
- width of winding
- edge stop

There are 99 power-failure protected winding programmes available to choose from.

A basic programme can be altered, duplicated or extended. The set-point value is changed on-line, i.e. with automatic operation in the starting or stopping condition. The programme structure is established by the user and, therefore, can be suited to the most diverse requirements. All inputs can be carried out via the GEL 8810 operator terminal.

More conveniently, the BB 8150 „Operating + Observing“ PC programme can be used to edit and save data and store it in or read it from the controller. Of course, this program can also be used to configure the controller. At the same time, the BB 8150 set-point editor input masks adapt themselves to the selected data structures automatically.

The PC program can be used to process communication, both with a separately operated controller and with a complex controller network. An automatic backup function reads the data and configurations from all controllers connected to the network and automatically produces the files required for administering the system. The possibility of storage on data media and a flexible printer driver facilitate documentation of plant data.

System requirements for the BB 8150 PC programme

- PC from 80386 (MS-DOS 3.30 only)
- Windows 3.x and Windows 95
- RS 232 interface

An RS 485 interface will be required if the controller is connected to a network. Where this is not available, the following can be used instead:

- V 24/ RS 485 converter, GEL 89010, including power supply or a
- V 24/ RS 485 converter, GEL 89011, with potential signal isolation and power supply.

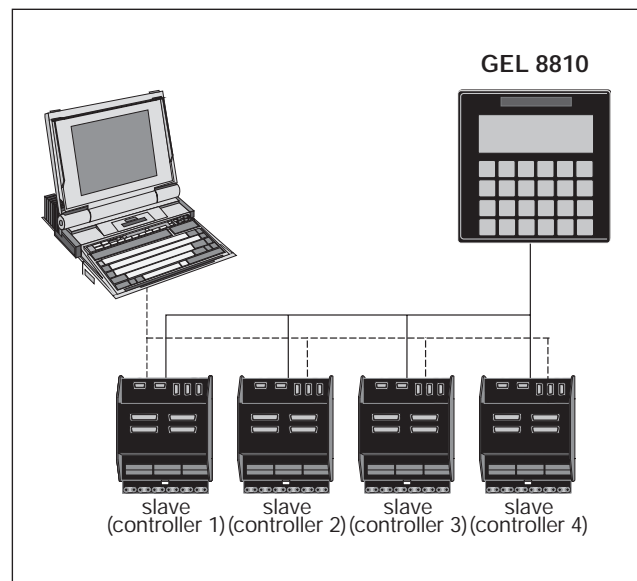
GEL 8810 operator terminal

The GEL 8810 operator terminal, measuring 160 mm x 160 mm at the front, is designed for control and monitoring in the vicinity of the controller. The 18 mm x 18 mm short-stroke keys can be labelled according to their specific use using push-in inserts.

The luminous, strongly contrasting display consists of an alphanumeric dot matrix LCD (4 x 20 characters, 8 mm high) with LED background lighting. The self-explanatory text on the display, either in English or German as required, guides the user via menus through the programming of functions and operating values.

The following convenient editing functions have been provided for this purpose:

- copying and pasting programmes
- erasing programmes and erasing the whole memory
- paging through memory contents, and other similar features



Further information on the GEL 8810 operator terminal is provided on a separate data sheet.

General information

Appropriate functions can be activated to avoid the build-up of material at the ends of the coil.

Drive control

The drives for the support or core are controlled via an analogue output with a voltage range of 0 V to 10 V and 0 V to ± 10 V in each case. The resolution is 1.22 mV. The following signals are also output:

- forwards / backwards
- release controller inhibit
- release brake

It is not absolutely necessary to control the core drive via the controller. This can also be achieved externally.

Maschine parameters (selection)

- power-failure protection
- selection of detector inputs (incremental / absolute)
- multipliers for actual value, display and nominal speed value
- zero point adaption for absolute encoders
- control parameters (speed, acceleration / braking / jerk time)
- passwords for nominal values and machine parameters

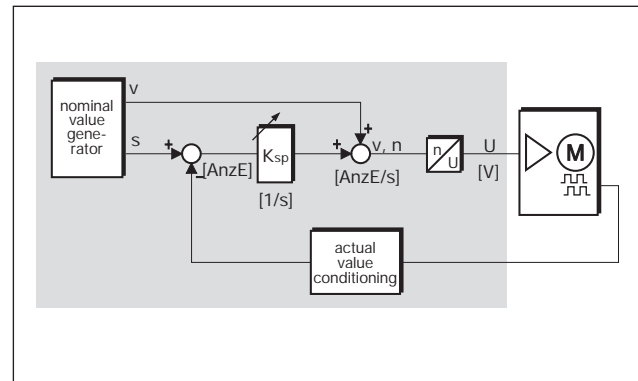
Acceleration and braking curve

The acceleration and braking curves for the drive are specified for each axle via the following pre-selectable parameters:

- maximum and operating speed and
- acceleration and braking time in both forward and backward directions

Control principle

A new position nominal value is calculated for the control principle adopted and specified for the control circuit every 2 ms. The difference between this value and the corresponding actual value is calculated and evaluated using a programmable factor responsible for the control dynamics. A calculated speed value is added (rotation-speed pilot control) to minimise the following error. In this way, very effective control of the drives is achieved which can be matched in each case.



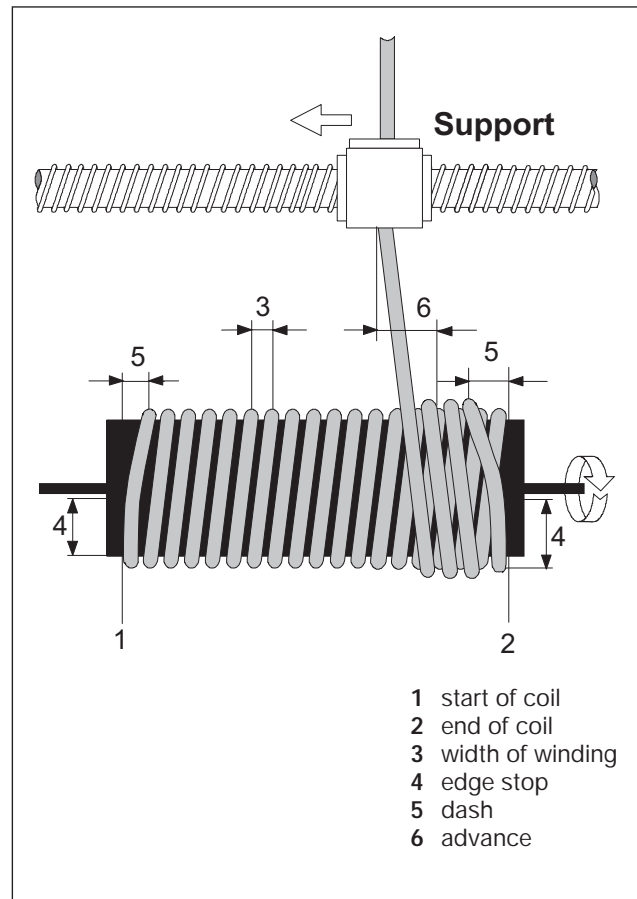
▲ legend

- v : speed
- n : r. p. m.
- s : path
- t : time (s)
- AnzE : display units
- K_{sp} : control factor (dynamics)

Programmable material parameters

Brief explanation of programmable material parameters

- **Start of coil**
The start of the coil is the front reversing point when winding on material. The input is given in actual measurement units, e.g. 10.22 mm.
- **End of coil**
The end of the coil is the rear reversing point when winding on material. The input is given in actual measurement units, e.g. 100.45 mm
- **Width of winding**
The width of winding is the difference between the start of the coil and the end of the coil.
- **Start position**
The start position defines where the winding starts. It can be programmed as the start of coil, end of coil or any other position.
- **Winding width**
The winding width defines the distance between two turns in one location and determines the advance speed for the support in relation to the core rotation.
- **Unloading position**
The unloading position is a programmable solid position for unloading completed coils or loading on empty coils.
- **Layer number**
When the layer number is reached, this is indicated via an output signal at which point the core rotation can be stopped and the winding terminated.
- **Edge stop**
At the end of a layer, the support stops and does not move in the opposite direction until the core has continued rotating to the value entered. In the case of flat material, it is important to fill the gap at the end of a layer and avoid the build-up of material.
- **Dash**
This is the additionally accelerated movement of the support in the opposite direction to the front end of the layer in order to avoid the build-up of windings at the end of the layer.
- **Trapezium**
The trapeze is a tapering or spreading of the winding pattern at the end of the winding on each layer.
- **Advance**
In the case of wide material, the support must continue to run past the end or start of the coil by the (advance) value programmed in.

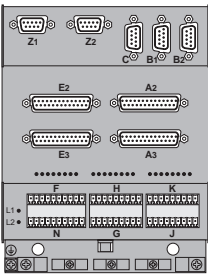


- **Core diameter**
The core diameter is required when entering an advance to correct the winding pattern automatically as the winding diameter increases.
- **Speed specification for the core**
The core can either be controlled externally or controlled via the controller. If controlled by the controller, the core rotation speed can be controlled independently from the support.
- **Target angle**
The target angle defines the turning point of the layer at the edge of the coil. By entering the target angle, the winding width is corrected internally so that symmetrical turning points for the windings are obtained in relation to the core.

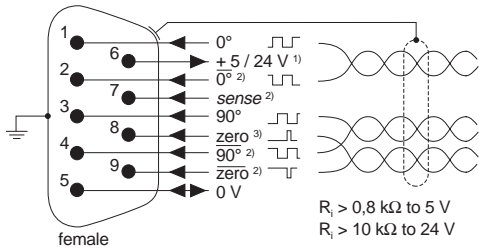
Technical data

Supply voltage		
input		18 ... 30 V DC or 15 ... 23 V AC
current consumption		approx. 300 mA (without load)
output		$U_{B=}$ - 1 V or $U_{B=} \cdot 1.4$
load current		approx. 400 mA (incl. 24 V-encoder supply)
Counting inputs		
logic levels	24 V	low: 0 ... +5 V high: +15 ... +30 V
	5 V	low: 0 ... +0.8 V high: +2.5 ... +5 V
input resistance	24 V	> 10 k Ω
	5 V	> 0.8 k Ω (push-pull: 1.3 k Ω)
input frequency		\leq 200 kHz
pulse width of zero signal		\geq 2.5 μ s
encoder supply	24 V	approx. $U_{B=}$ - 1 V or $U_{B=} \cdot 1.4$ total encoder current < 400 mA
	5 V	5 V \pm 5% stabilized at the encoder (return by sense line; max. 6.5 V at the output); total encoder current \leq 600 mA (\leq 400 mA for one encoder)
SSI inputs		
data, clock		according to specification RS 422
clock frequency		max. 375 kHz
encoder supply		approx. $U_{B=}$ - 1 V or $U_{B=} \cdot 1.4$
Logic inputs (terminal strip)		
level		low: 0 ... +5 V high: +15 ... +30 V
input resistance		> 10 k Ω
Logic outputs (terminal strip)		
I_{max}		300 mA, 8 outputs together 600 mA, su- stained short circuit-proof
overload response time		\geq 1 μ s
supply voltage		external 8 ... 30 V DC (abs. max. value: 35 V DC)
Analogue outputs		
voltage range		-10 V ... 0 ... +10 V
resolution		1.22 mV (14-Bit-D/A-converter)
max. offset error		\pm 0,7 mV with reference to 23 $^{\circ}$ C

Analogue outputs	
I_{max}	6 mA, sustained short circuit-proof
offset temperature coefficient	typ. 0.20 mV / 10 K, max. 1.00 mV / 10 K
Digital inputs (optional, 25-pole D-subminiature plug)	
inputs	2 x 24
level	low: 0 ... +5 V high: +15 ... +30 V
input resistance	> 10 k Ω
Digital outputs (optional, 25-pole D-subminiature plug)	
outputs	2 x 24
I_{max}	20 mA per output, with internal supply: 200 mA totally for all 48 outputs
supply voltage	$U_{B=}$ - 1 V or $U_{B=} \cdot 1.4$ (internal) or 8 ... 30 V DC (abs. max. value: 35 V DC (external))
Serial interfaces	
Ser1	3 RS 485 or RS 232 C, electrically isolated via optocoupler
Ser2	RS 422
Ser 3	RS 485, electrically isolated via optocoupler
Count range	$\pm 2^{31}$
Control scanning time	typical 2 ms
Nominal value storage location	6416
Climatic applicability class	
relative humidity of air	up to 95 %, no condensing
operating temperature range	0 $^{\circ}$ C ... 50 $^{\circ}$ C
storage temperature range	-20 $^{\circ}$ C ... +80 $^{\circ}$ C
EMC (observance of assembly instructions is mandatory)	
electromagnetic emissions	acc. to EN 50081-1
electromagnetic immunity	acc. to EN 50082-2
Display	
standard	2 LEDs
option (only for data inputs/outputs)	24 LEDs, signaling the switch position of inputs and outputs
Housing	
material	sheet metal (Zincor) powder-lacquered black
fixture	snap-on mounting on top hat rail as per DIN EN 50022-35 or simple fastening with screws
Protection class	IP 20



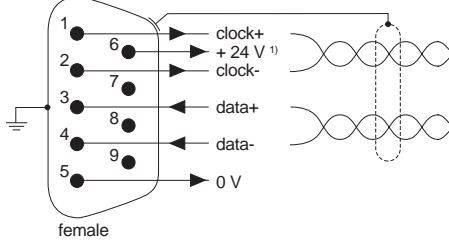
Connectors Z1, Z2 (counting input for incremental encoders)



- 1) change with DIP switch (same voltage value as at N4, 26 V max.)
- 2) do not connect if not used
- 3) alternative: sensor signal for *reference fine* function; if you use different voltage levels for the encoder (5 V) and the sensor (24 V) adjust with DIP switch accordingly

E281047Z

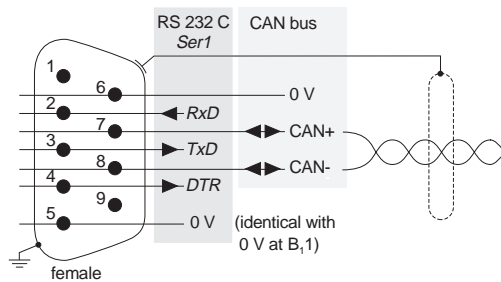
Connectors Z1, Z2 (actual-value input for an absolute SSI encoder)



- 1) change with DIP switch (same voltage value as at N4, 26 V max.)

E281047S

Connector C (serial interface RS 232 C and CAN bus)

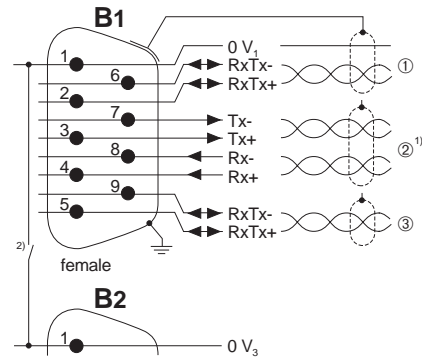


E281047C

Connectors B1, B2 (serial interface)

(serial interface)

With the exception of Pin 1 the two connectors are connected in parallel with each other.

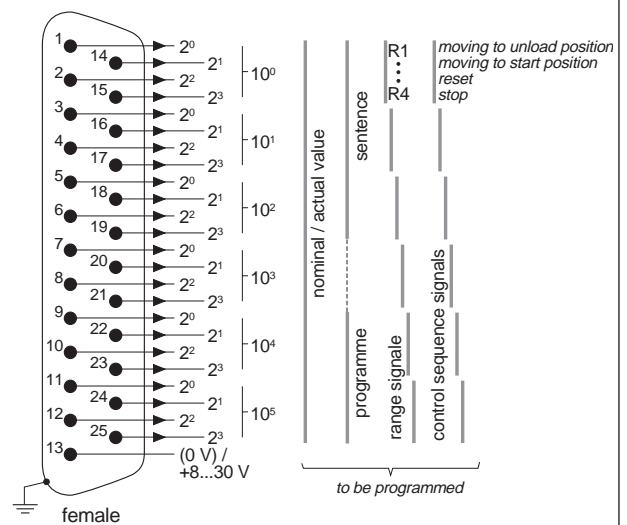


- ① Ser1: RS 485 with galvanical separation(PC etc.)
- ② Ser2: RS 422/485 (daisy chaining EcoController)
- ③ Ser3: RS 485 with galvanical separation (operator terminal GEL 8810)

- 1) switch on from RS 422 to RS 485 using the DIP switch
- 2) close DIP switch if several EcoControllers from a cascade arrangement

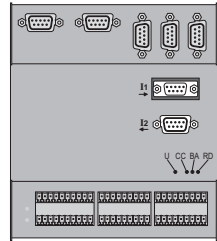
E281047B1

Connectors A2, A3 (data output)

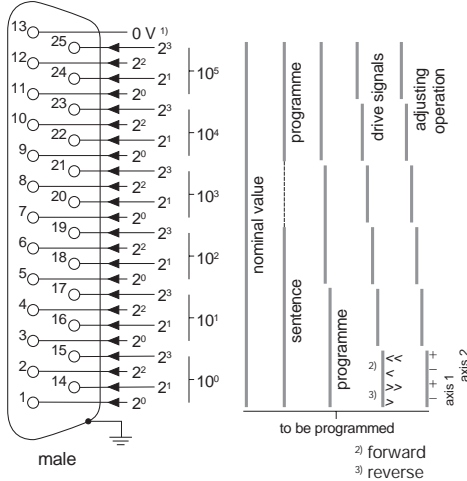


E281547A

Pin layouts

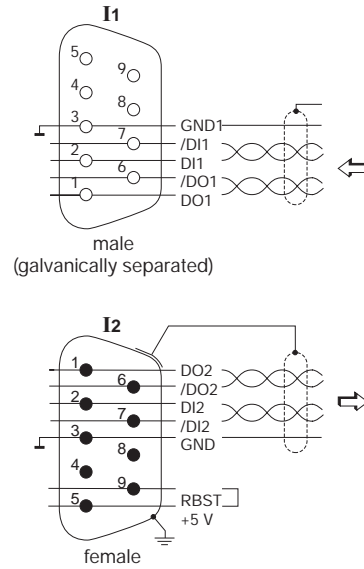


Connectors E2, E3 (data input)



E281447E

Connector I (InterBus-S)



E281047I

Terminal strip F (data input or output)

data input E1

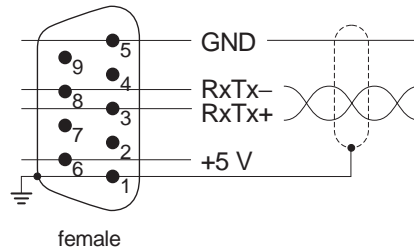
1	—	0 V	
2	←	forward	min
3	←	forward	max
4	←	reverse	min
5	←	reverse	max
6	←	forward	min
7	←	forward	max
8	←	reverse	min
9	←	reverse	max
10	←	+U	

and /or data output A1

1	—	0 V	
2	→	R1	moving to unload position
3	→	R2	moving to start position
4	→	R3	reset
5	→	R4	stop
6	→	R1	moving to unload position
7	→	R2	moving to start position
8	→	R3	reset
9	→	R4	stop
10	←	+ 8 ... 30 VDC	

E281525 F

Connector P (two PROFIBUS ports connected in parallel)



Important!

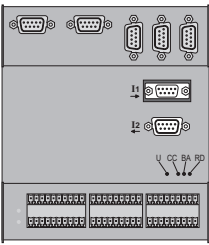
The bus terminator GEL 89030 which is included in the scope of supply must absolutely be plugged into connector P.

E281047P

Terminal strip N (supply voltage)

1	←	~	supply voltage
2	←	~/+	15 ... 23 V AC or + 18 ... 30 V DC
3	←	-	
4	→	+	supply voltage for signal encoders ≈ U _s -1 V, max. 400 mA
5	—	-	
6	—	-	
7	↔	0 V (support)	analogue output (option)
8	↔	0 V (core)	
9	→	± 10 V (support)	
10	→	± 10 V (core)	

E281525N



Terminal strip K-support axis (control outputs)

1	→	/malfunction (invers)
2	—	no function
3	→	forward (support)
4	→	reverse (support)
5	→	cancel controller lock (support)
6	→	release brake (support)
7	→	overrun end of coil
8	→	overrun start of coil
9	←	8 ... 30 V DC

J

9	—	0 V *)
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*) external supply

E281525K

Terminal strip J (control inputs)

1	←	external wind reverse SA
2	←	external wind reverse SE
3	←	proz. width of winding alteration (2/23)
4	←	proz. width of winding alteration (2/24)
5	—	no function
6	←	reference coarse (core axis)
7	←	reference 2/1 (support axis)
8	←	zero delta_s (support axis)
9	—	(see terminal strip K)

E281525J

Terminal strip H-Coiling (control outputs)

1	—	no function
2	→	start position reached
3	→	unload position reached
4	→	number of layers reached
5	→	analogue output < U %
6	→	movement to coil end
7	→	reference reached
8	→	coiling synchronism ± tol.
9	←	+8 ... 30 V DC

G

9	—	0 V *)
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*) external supply

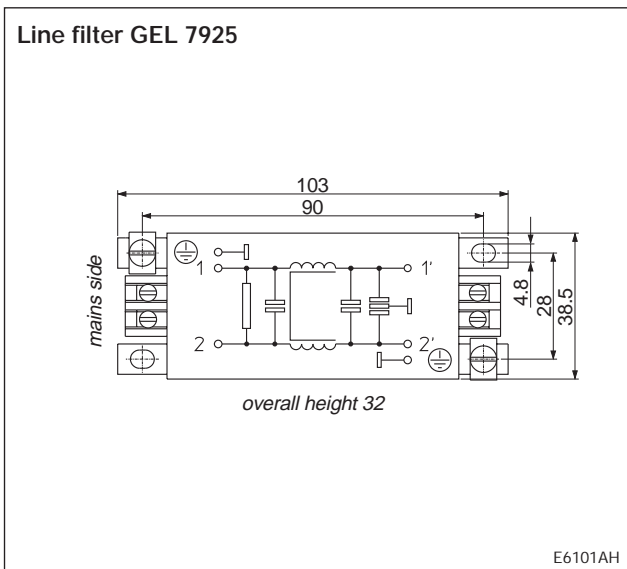
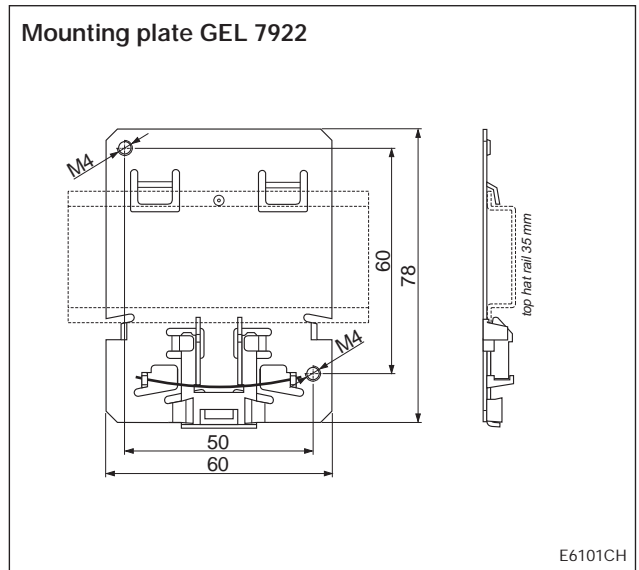
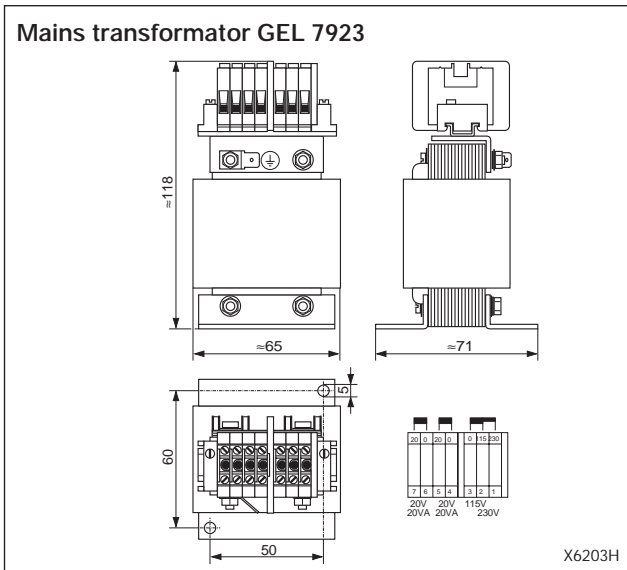
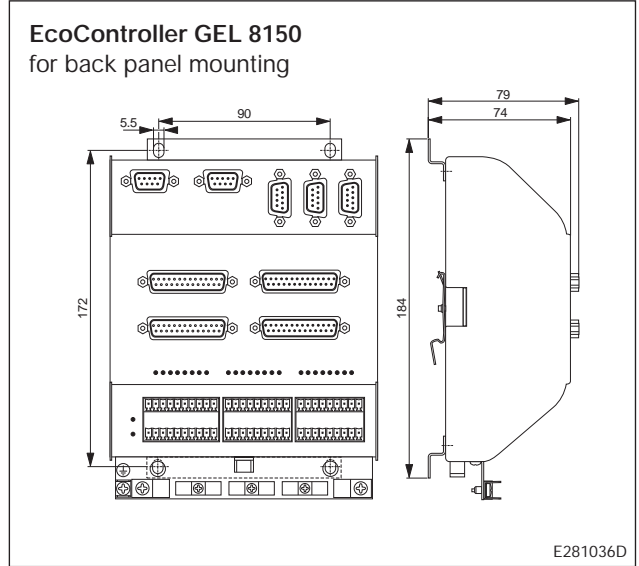
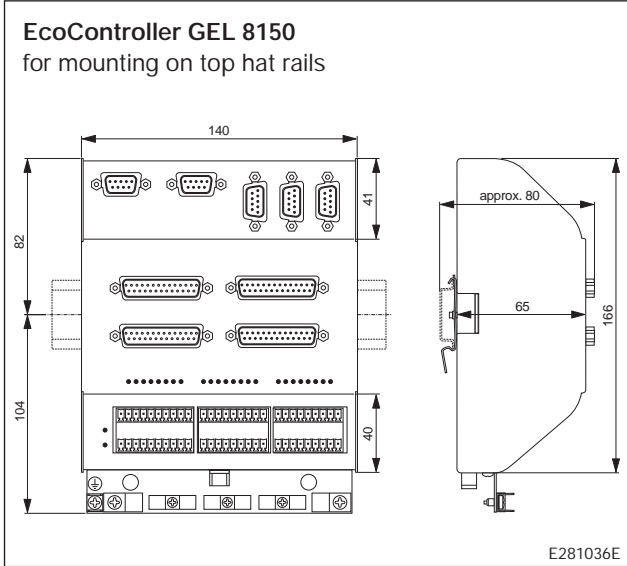
E281025H

Terminal strip G (control inputs)

1	←	start
2	←	/stop (inverse)
3	←	reset
4	←	move to start position
5	←	move to unload position
6	←	reference search
7	←	reversing switch
8	←	reference coarse (support)
9	—	(see terminal strip H)

E281525G

Dimensioned drawings



81	50	X	X	XX	X	X	0	description
							0	CAN bus not mounted
							1	CAN bus
							2	CAN bus, extended
							0	data input/output not mounted
							6	48 data outputs, 48 data inputs, 24 LEDs
							8	InterBus-S
							9	PROFIBUS
							0	actual value inputs not mounted
							A	incremental counter input 24 V
							B	incremental counter input 5 V
							S	absolute SSI encoder
							0	analogue outputs not mounted
							B	2 analogue output 0 ... ± 10 V, 14 Bit
							A	control inputs/outputs 16 digital inputs, 16 digital outputs 300 mA, 8 combined digital input/outputs

PC software

Operating and observing for GEL 8150

BB 8150

Accessories

converter (V24/RS485) incl. supply unit

GEL 89010

converter (V24/RS485) with galvanic

GEL 89011

signal separation incl. supply unit

GEL 89015

cable from converter to EcoController

cable from EcoController to EcoController

● transmitter/receiver

GEL 89016 SED

● receiver/receiver

GEL 89016 EED

cable from operator terminal GEL 8810 to

EcoController, 5 m

GEL 89019

connection cable RS 232C between PC

and EcoController, 2.5 m

GEL 89022

D-type subminiature adapter:

- 25-pole male to 9-pole female
- 25-pole male to 25-pole female
- 9-pole male to 9-pole female

GEL 89025

GEL 89026

GEL 89027

bus terminal connector (PROFIBUS)

GEL 89030

mounting plate for mains transformer

GEL 7922

mains transformer

GEL 7923

line filter with current-compensated chokes

250 V~

GEL 7925



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