Operating Instructions
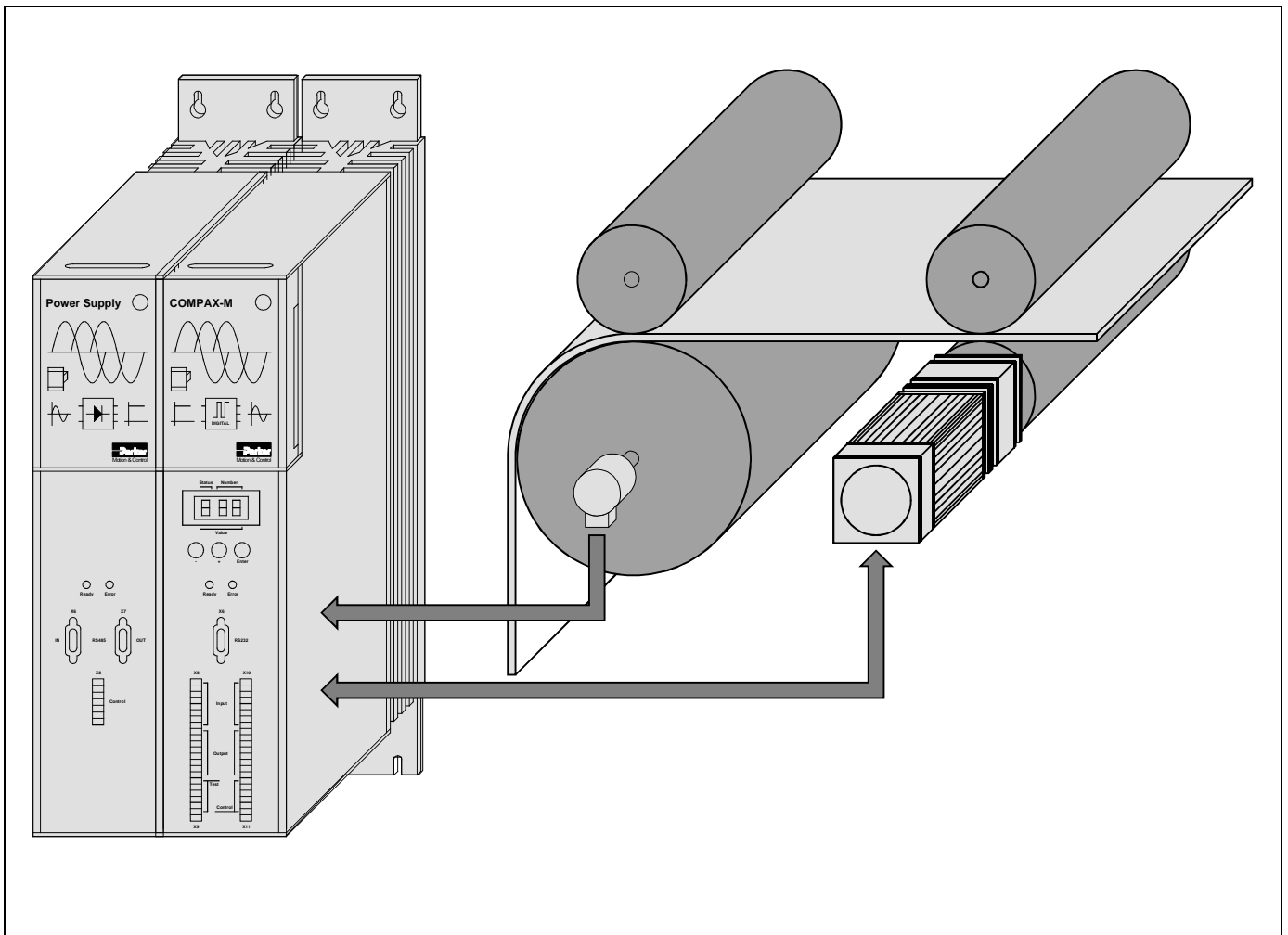
Electronic Gear Units

- In addition to COMPAX-M/S - Product manual -

From Software version V2.00   January 98

COMPAX XX60 M / S

Contents

This documentation is valid for the following units:

- COMPAX 2560S
- COMPAX 4560S
- COMPAX 8560S
- COMPAX P160M
- COMPAX 0260M
- COMPAX 0560M
- COMPAX 1560M

Code of Unit Designation

i. e.: COMPAX 0260 M:

COMPAX: name
02:      power class
60:      variants i.e. "00": standard unit
M: unit type   M: multi axis unit
                     E: single axis unit

HAUSER-Name Plate

HAUSER

038106 0001 951-160101 Compax 0260M

E2

option name
serial number
equipment name
part number

This documentation is in addition to the following standard documentations:

- User Guide / ServoManager
- Detailed instructions of certain options.

1 Overview

The electronic gear unit is different to the COMPAX M / S standard unit in the following features:

Necessary options:	E2/E4 or E7 or A1 (HEDA[1])
Possible operation modes:	Normal mode and endless mode E7 at speed control
Permitted drive type:	all
Mechanical reference system:	As standard unit
Special functions:	◆ Angular and speed synchronous control ◆ Superimposed movements ◆ External change of the gear unit factors.
Additional commands:	none
Commands not available:	SPEED SYNC GOSUB EXT restricted on E9...E13 GOTO EXT restricted on 9...E13 Label related positioning POSR
Changed configuration:	◆ Addition of travel instructions in increments (P90="0") "universal drive". Hence a higher accuracy is achievable
Changed commands:	none
Changed E/A functions:	E14: Change of reference system E15: Gear ratio selection E16: Enabeling of the master reference value.
Changed parameters:	P35: Gear ratio 1 P36: Gear ratio 2 P37: Changes to speed synchronisation P38: Synchr. time for the change to speed synchronisation P38 has to be set to 1 if P37=0!
Changed status:	S41: External speed S42: External position
Others:	Possible to check the software limits in the slave mode. **Changed emergency stop behaviour:** ⚠ The emergency stop behaviour is adapted to the functions of the "electronic Gear Unit". With emergency stops (information on release of emergency stop you find in the product manual), the drive will be de-energized; the axis consequently runs free.

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[1] Find the discription of the HEDA in the COMPAX User Guide.

2 Configuration

The configuration has been extended with respect to the standard unit by the addition of a measuring unit of "increments" (P90="0").

With the measuring unit "increments" an exact synchronous operation without drift and calculation error is possible. This is valid for operations with or without a master in endless and normal work.

⇨ This measuring unit is only useful with the drive configuration "general drive". With other types of drive the accuracy won't be higher.

With the measuring unit "increments" the "travel per motor rotation" is given in increments when configuriation is in the "general drive mode."

It is valid: $P83 = 2^n$ with n = 4, 5, 6, ...16

This is a resolution of 16 .... 65536 increments per motor rotation.

By adjusting the motor rotation factor you can influence the maximum travel distance and the resolution:

The maximum travel distance is limited to +/- 4 million units. There are 61 rotations giving a maximum resolution of 65536 increments per motor rotation. The maximum travel distance will be increased by a reduction of P83. The following is valid:

P83	max. travel distance in motor rotations	P83	max. travel distance in motor rotations
16	250000	2048	1953
32	125000	4096	976
64	62500	8192	488
128	31250	16384	244
256	15625	32768	122
512	7812	65536	61
1024	3906		

In the **endless operation mode** this limit is valid for one command. Synchronous movements have no influence on the travel area.

In the **normal operation mode** this limit is valid for the whole travel area. With an internal reference as standard you have to consider the synchronous movement. This is not the case with an external reference.

3 Functions

COMPAX XX60 M / S can accept an external master reference value and work as an alternative, or in parallel with the internal reference value. Depending on the operation mode a master reference value can be supplied from:

◆ An encoder on the master axis or

◆ An encoder simulation of COMPAX M / S or SV Drive, if it will be used for the control of the master drive.

It is registered by an interface of COMPAX. The value of the encoder pulses, generated in COMPAX is set with Parameter P143. The Slave Drive can operate synchronisation or a ratio in a wide setting range (i>1 or i<1) can be chosen via the parameters. A negative sign means a reversal of rotation. COMPAX X60 M / S has two parameters (P35 and P36) with which to set standard factors.

The external reference value input can be controlled via two real time inputs (time delay 1ms). In addition to the ENABLE-input (input 16) which frees the external reference value for the controller, it is possible to switch between the two standardratios in parameter P35 and P36 (input 15).

The synchronisation to the master speed can be made during speed synchronisation with E16 within a defined acceleration time (P38). For operation mode "position control" angular synchronisation will be processed immediately.
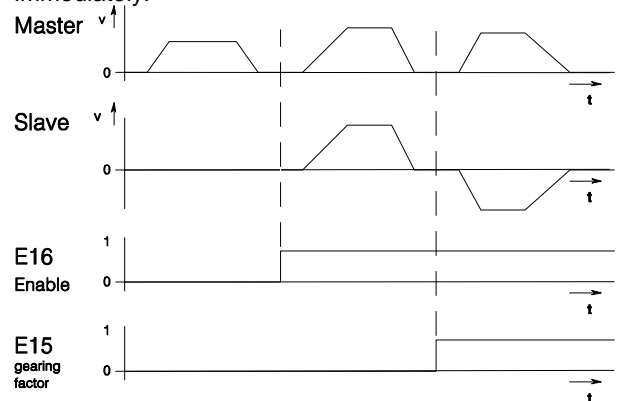
schematic 1: release of master ref. value and change over of gear factor (i1 = -i2)

3.1 Internal reference as Standard

In the case of an internal reference as standard (E14="0") all specified reference values will be related to the zero point of the slave drive. Internal specified reference values and external master pulses will already have been calculated with reference to the zero point of the slave drive. The zero point will not be shifted by externally specified reference values.

⇨ The selection of the internal or external reference value is made by E16.

Example: schematic 2: The positioning cycle consists of four proceeding movements.

◆ absolute positioning to 100 mm (P1).

◆ release of external ref. value (E16="1")

Via the pulses of master encoder, a further distance of +70 mm (P2) will be travelled.

◆ relative positioning by +30mm (P3)
◆ absolute command to the zero point (P0)

➡ The external ref. value will only be accepted when no internal proceeding command is in process.

absolute pos. to 100mm

external reference value +70mm

relative pos. to +30mm

absolute pos. to 0mm

P0   P1   P2 P3
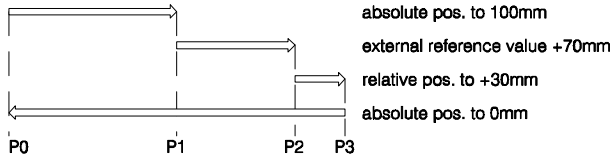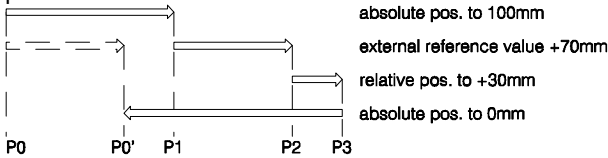
schematic 2: internal reference as standard

3.2 Master Position as Standard

With master position as standard (E14="1") the internal zero point of the slave drive will be shifted relative to the external reference value. The internal reference system will be changed after resetting E14 (E14="0"). This can be corrected by the reference sequence (search machine zero). In this operation mode superimposed movements are possible. They can be used when an internal working program is operating on a moving workpiece.

This operation mode will be shown in schematic 3. It is based on the positioning cycle shown under 3.1. The slave axis refers to the internal zero point (P0). The zero point will be shifted relative to the value of the standard when reading the external reference value.

With the absolute command. The zero point (POSA 0) will be positioned to P0`. P0` is shifted by the amount of the external positioning value with respect to P0 .

The external reference value can also be activated during an internal proceeding movement and superimposed on to the internal positioning. This operation mode can be used when an internal program is intended to be executed on a moving part.

absolute pos. to 100mm

external reference value +70mm

relative pos. to +30mm

absolute pos. to 0mm

P0   P0'   P1   P2   P3

Schematic 3: Standard Master Position

➡ The zero point shift remains after reset of E14 (="0").

Overview of the operation modes:

	E14="0" Internal reference	E14="1" Master as reference
E16="0" External reference value not valid	Normal positioning; is the function of the standard unit.	Independent from the external reference value with E16="0" a travel movement can be made.
E16="1" External reference value valid	With E16="1" the internal command line program is operating independent from the external reference value.	
	Internal positioning and external reference value won't be superimposed. The external reference value is not valid as a relative position to the actual position. The drive is angular synchronous to the master. An applied internal reference value is more important. It interrupts the synchronity[2].	**A superimposed movement is developed.** The master movement and the internal positioning will be superimposed. The external reference value will be superimposed to the internal frame of reference as offset.
	Only the external or the internal reference value can be valid. A superimposed movement is not possible. The internal reference is maintained.	The reference to the machine zero initiator is established after the E14="0" by the command: "machine zero search".

3.3 Adjustment of speed synchronisation

➡ The following is just valid if E16="1" .

2 A defined break up of the synchronuous drive function will be optained by control of the internal position through a digital input. For example: N020: If E7=0 GOTO 20
                    N021: POSA 1000
With E7="1" the synchronisation will end and the internal positioning command (POSA 1000) will be valid. The commands before "POSA 1000" are processed during the synchronous operating mode.

Should the processed material be destroyed, due to the control of the tracking errors, the operation mode "angular synchronisation" has to be changed to speed control mode. COMPAX offers the possibility with P37="1" (change only possible at a standstill of the drive) to change in speed synchronisation. COMPAX synchronises the speeds. At E14="1" the internal positionings are superimposed, which means that a mechanical tension is coming into being proportional to the value of the positioning.

With parameter P38 a synchronous time for the switch on and off of the external reference value can be set via E16 and for the change of the gear ratio via E15. COMPAX synchronises itself with the acceleration time which is set by P38 (P38 is identical with the ACCEL value) like a ramp profile to the external speed. When switching off the external reference value (E16="0") the speed changes like a ramp profile to an internal adjusted speed.

3.4 Supervision of Software Limits

With COMPAX 60 M / S also the slave's process motion can be supervised with regard to limits. The parameters P11 (positive limit) and P12 (negative limit) are regarded as limits.

Function

The slave follows the master; on reaching the limits
- the slave is stopped,
- the counting pulses at the encoder input are disabled
- the error message 'E25: invalid position' is put out.

Quitting of the error message
- After 'quit' COMPAX 60 M / S is ready for internal positionings; the encoder input, however, is still disabled.

Enabling of the encoder input
- The external encoder pulses are enabled again by a positive edge at E16 or by travelling to the machine zero point. The slave will follow the master even if there does not precede any 'quit'.

After enabling the encoder input the slave also moves beyond the software limits. The limit supervision will only become active again, if the slave travels back to the admissible area.

Switching off the limit supervision

The preset values have to be assigned to the limits.
- P11=+4 000 000
- P12=-4 000 000
The admissible value ranges of the limits are:
- P11: 1...4 000 000
- P12: -1...-4 000 000

⚠️ **Attention!**

- At normal operation, with activated software limit supervision, correct operation after 'power on' will only be possible after reaching the machine zero point.
- This also applies to the period of time needed for activating the motion towards the machine zero-point till the moment of actually reaching this point.

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4. Special Inputs and Outputs

4.1 Input functions

| Change over of standard | E14 ⊓ |

- E14="0": The internal reference (real zero) is used as standard for the positioning events. Superimposed movements are not possible.
- E14="1": The position of the master is used as standard for the positioning events. Superimposed movements are possible.

  The relation to the internal reference is lost after the resetting of E14 (E14="0") a reference drive command (search machine zero) is necessary.

| Gear ratio selection | E15 ⊓ |

- E15="0": P35 is adjusted as gear ratio.
- E15="1": P36 is adjusted as gear ratio.

| External reference value Switch on and off | E16 ⊓ |

- E16="0": Positioning without external reference value.
- E16="1": The external reference value is valid. The drive moves position synchronous to the master.

4.2 Output functions

The electronic gear unit has no special outputs.

5. Special status assignment

S41: Material speed in % relative to the nominal speed of the axis.

S42: External position

6. Specific Parameter of Electronic Gear Unit

No.	meaning	unit	minimum value	Standard value	maximum value	valid from
Parameters of the electronic gear unit						
P035	gear unit factor 1 (E15=0)		-20,0000	0	20,0000	VP
P036	gear unit factor 2 (E15=1)		-20,0000	0	20,0000	VP
P037	speed ("1") angular ("0") -synchronisation At P37=0, P38 has to be put on 1!		0	0	1	VP
P038	synchr. time for speed synchronisation change over At P37=0, P38 has to be put on 1!	ms	1	0	60 000	VP
P68	Filter time constant for external speed pilot control	%	0	0	550	VP
To define the encoder interfaces (option)						
P143	encoder pulse value (channel 1)		120	4096	2 000 000	VC
P98	travel per encoder rotation	Einheit (P90)	1,00	0	4 000 000	VC