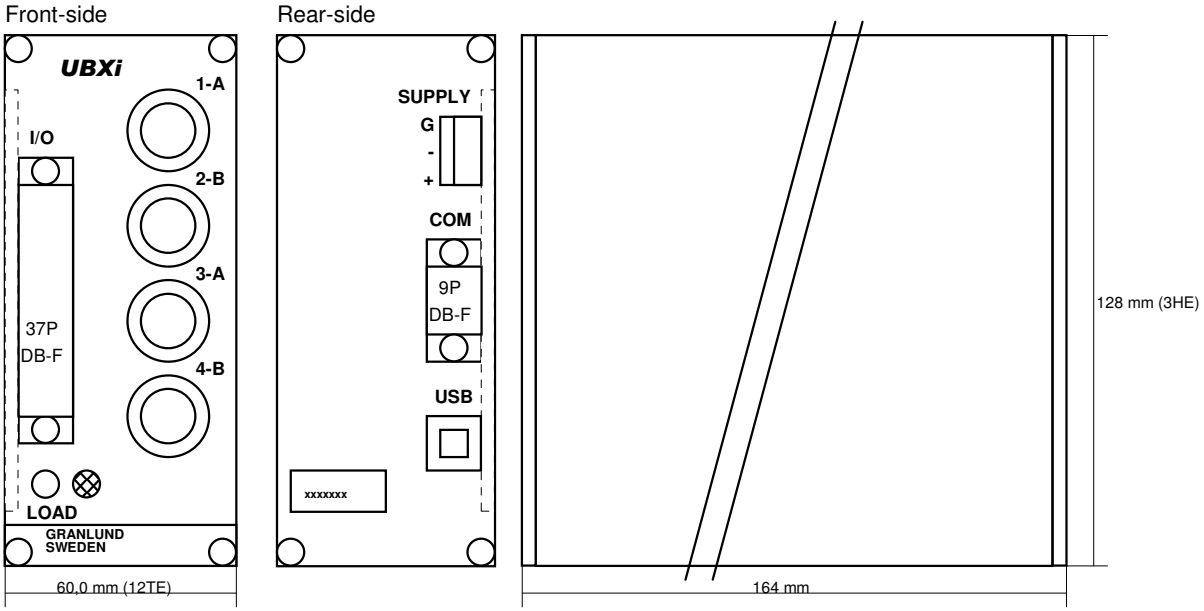
GRANLUND

2008-10-17

UBXi (expansion system)



FEATURES UBXi

- USB adapted system according to specification 1.1, 12Mbits/sec transfer.
- Specially adapted for Mitutoyo digital linear gages, of 4 inputs per unit.
- Able to connect up to 16 units to one personal computer using the USB-buss, for a configuration of total of 64 gages, or one single unit using RS232C-communication.
- A wide range of I/O and software controls including:
  - ◆ Reading gages in high speed operation.
  - ◆ Direct I/O-control of 8 inputs and 8 output ports (+24V).
  - ◆ Out control of two stepmotors (linear motions) with synchronized input of gages, including. limitcontrols and left or right reference run mode.
  - ◆ Continuously input function for buffered readout of values for forms and polarcurve.
  - ◆ Pulsedetector input for counterfunctions or reading angle.
  - ◆ Analogues inputs (0 - 5V, 10 bits), for special measurefunctions.
  - ◆ Analogue outputs (0 - 5V, 10 bits), for analogue servo or motor control.
  - ◆ External trigginput for reading out gage.
- Peak-hold measurement of max, min, max difference, etc. between gage pair.

CONFORMANCE TO EC DIRECTIVES

This unit conforms to the following EC Directives:

- EMC Directive (89/336/EEC)

  EN55011: 1992, Group 1, Class B EMC emission

  EN50082-2: 1995, Industrial environment EMC immunity

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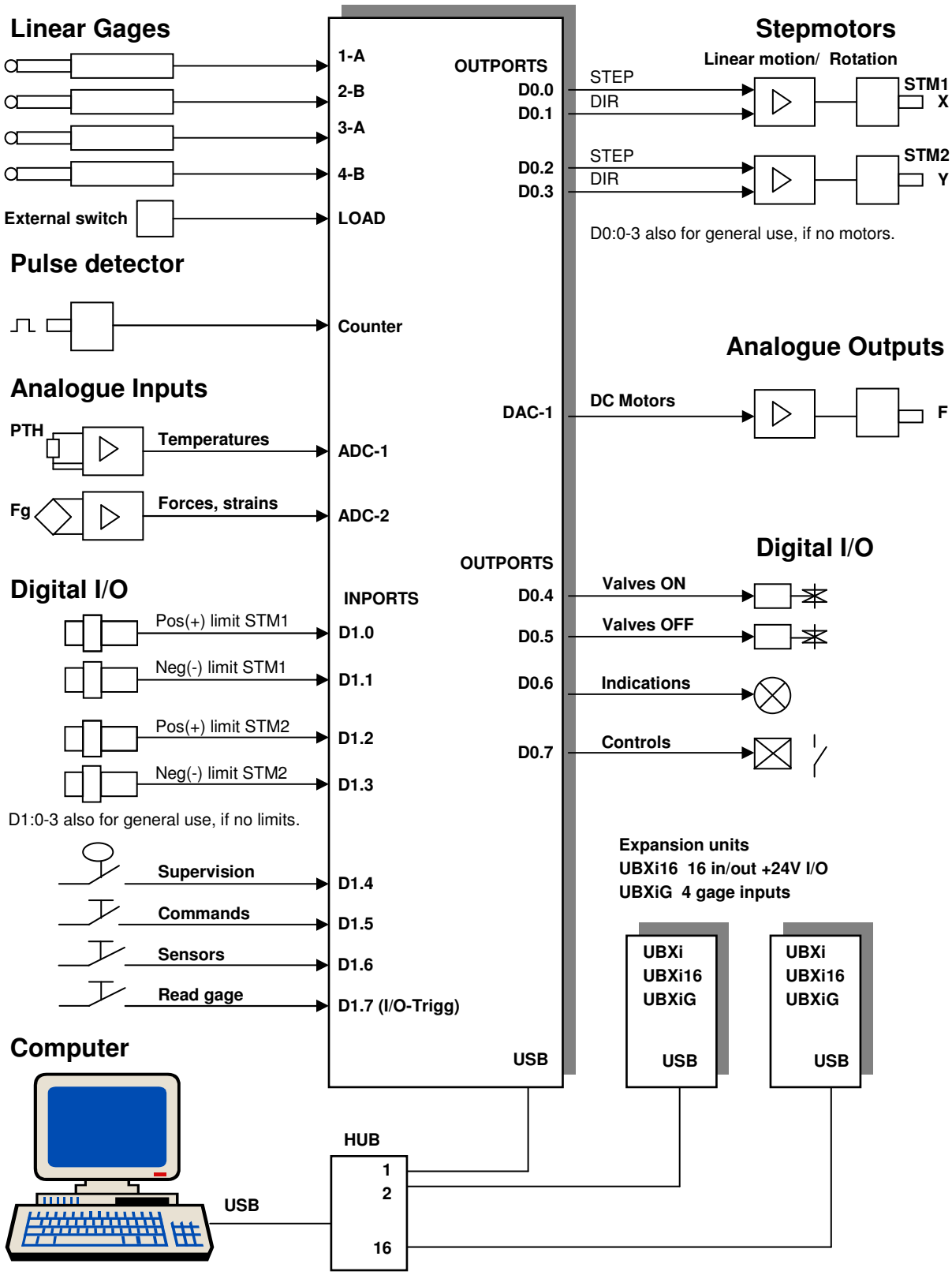

SPECIFICATIONS

Main data

Update frequency	1 kHz (1 ms) for all inputs and final readout values.
Operating temperature	0 to 40° degrees C (20%RH to 80%RH, without condensation)

Power supply

Power supply	DC +12 to +30V, normal industry standard.
Connector pins	Connector: LMI 245 203 01, 3-pole terminal block/plug.
1:	PLUS (+24V)
2:	MINUS (0V)
3:	Protected ground.

USB

Number of USB input	1
Standard	1.1 USB specification, max 12 Mbits/sec.
Connector pins	Connector: USB-peripheral (type B).

RS-232C

Number of RS323C	1		
Protocol	Start/stop.		
Fixed setup	19200 kBaud, even parity, 8 data bits, 1 stop bit, Xon/Xoff method.		
Connector pins	Connector: 9p DSUB female (screw locking).		
1:	NC	*PC-side/signals*	
2: out	TXD	------	RXD inp
3: inp	RXD	------	TXD out
9:	NC		
Applicable cables	DB9M - DB9F pin to pin (modem).		

Linear Gage inputs

Number of gage input	4		
Applicable gage input	Differential square-wave (90° phase difference, RS422 eqv).		
Applicable gage	Mitutoyo LGB (exl. 0.0001 mm resolution), LGF, LGE, 100 mm LG.		
Signal pitch/gage	LGF:	0.0005 mm	2.0 µm pitch, 0,25 µsec.
(min edge interval)	LGB/LGF:	0.001 mm	4.0 µm pitch, 0,50 µsec.
	LGE:	0.005 mm	20 µm pitch, 4,00 µsec.
Max input frequency	625 kHz (differential square-wave).		
Max counting speed:	2,5 MHz.		
Max response speed	380 mm/sec.		
Resolution (counters)	20 bits (max transferable value: ±524.288 mm, LGB).		
Connector pins	Connector: Hirose RM12BRD-6S.		
1: out	+5V (gage power supply)		
2: inp	phase A (pos)		
3: inp	phase B (pos)		
4: inp	phase A (neg)		
5:	GND		
6: inp	phase B (neg)		
Gage powersupply	5V (4.8V to 5.2V), max 4x120 mA (LGF), ripple 200 mV p-p max.		

Gage-LOAD inputs

Number of input	1 (< 5 mS responds time, 75 mS repeat time).
Applicable switch	Mitutoyo No: 937179T.

Pulse detector inputs

Number of pulse input	1
Applicable pulse input	Differential square-wave (90° phase difference, RS422 eqv).
Detector signals	phase A (pos/neg), phase B (pos/neg) and zero pulse (pos/neg).
Counting mode	4 x Input pulses, A-flank up/down and B-flank up/down.
Max input frequency	625 kHz (differential square-wave).
Max counting Speed:	2,5 MHz.
Max response speed	380 mm/sec.
Resolution (counter)	32 bits.
Connector pins	See common I/O-connector.
Detector powersupply	5V (4.8V to 5.2V), ripple 200 mV p-p max.

Digital I/O port output

Number of ports output	1 (8 bits)
Sourcedata	+24V (pos logic) optoisolated, max 500 mA short-circuit proof.
Portsignals	D0:0-7 (port 0).
Connector pins	See common I/O-connector.
Port external supply	DC +15 to +35V, 3 A (max 1A/channel PTC), normal industry standard.

Digital I/O port input

Number of ports input	1 (8 bits)
Input	+24V (pos logic) optoisolated, DC +15 to +35V, max 30 mA.
– Trigg inputs (bits)	1 (< 5 mS responds time, 75 mS repeat time, positive flank).
Port signals	D1:0-7 (port 1). D1:7 programmable trig input (only bit 7).
Connector pins	See common I/O-connector.

Analogue ADC input

Number of ADC inputs	2
Range / conv. time	0 - 5V, 1 ms, 10 bits, min 100 kohm impedance.
Portsignals	ADC1-2
Connector pins	See common I/O-connector.

Analogue DAC output

Number of DAC output	1
Range / settlingtime	0 - 5V, 10 ms, 10 bits, max 600 ohm outimpedance.
Portsignals	DAC1
Connector pins	See common I/O-connector.

Buffered input reading (Continuously input scan)

Number of buffers	1
Scanfrequency	1 - 1000 Hz (1 kHz).
Max memory	2 Mb. (8 or 4 bytes per input)
Inputs selectable	Gage G1 - 4, Pulsedetector, Elapsed time, Analogue inputs 1-2, Dig. inport.

Operation When buffered input reading is started, the selected inputs are continuously stored as datablocks in memory with selected frequency. The buffered input reading is activated (running) if a continuously input scan is started, **or** if stepmotor 1 is started in buffering mode. In the later case, inputs are stored synchronously with the motor stepping; i.g. a new datablock is stored at each step.

Operating commands (USB and RS232C)

General formats (ASCII)

mmmsson,<d1>,<d2>CR	Command string incl. data/block, else mmmsssnCR, if no data.
OK,<resp>CRLF	Respond string incl. n datablock, else OKCRLF, if no data.
OK,<d1|d2|..>, < d1|d2|..>, .. CRLF	Responds string incl. multiplier datablocks separated by commas and datatypes separated by | (specially for read out buffer). **1)**

1) The | char and TAB is also used as a separate and end char for asynchronies inputs.

NG,<error>CRLF	Error responds for a command
<error>	Error number 01, 02, ... 99, fixed two chars (see error list).
mmm	Command (1:st 3 chars), for ex. INP (input command),
ss	Operand (next 2 chars), for ex. LG (linear gage),
o	Sub operand (next 1 char), for ex. V (actual gage value)
n (for index commands)	Index (last char), for ex. 1 (linear gage no: 1). **Note!** Not for all commands.
<data>	Write/read data for command, prefixed by comma (,).
See command	**Note1!** For decimal values, **only** decimalpoint (.) is used.
System initialize	The commands are active for all subsystems.
ASC(3) without CRLF	Clears a command in progress, and activate the unit for new command.
CLRSYS	Clears and initialize all gage, presettings, peakvalues, motors and buffers. **Note1!** The clear command, do **NOT** reset the error mask and I/O-outputs. **Note2!** After clear, always wait min 25 mS for next command.
CLRERR	Cancels the current pending errors in the error mask.
INPERR	Read pending error bitmask, Resp.= b1,b2, …b14 (hexformat).
INPVER	Read programversion, Resp.= Ver:4502-0004C Dec 14 2001 (example).

Updating commands	To be used for continuously inputs, program loops.
INPUPD	Reads err bitmask, port 0, 1 and ready-status for stepmotor 1,2. Resp. = <err.mask>,<portv0>,<portv 1>,<mot 1>,<mot 2> **Note1!** Ready status **running** for motor's are always set regardless if motors are running (started). If not, the status is reset directly after read. **Note2!** Outbits 0-3 for active motors are masked to zero, when input port.
INPUPG	Reads err bitmask, gage 1 to 4 and counter. Resp. = <err.mask>,<gage1>,<gage2>,<gage3>,<gage4>,<counter>
Liner Gage read/set	Responds = ±1234.567 (dec), float. dec.pos.
SETLGR1-4,<r>	Setup resolution/pitch (0= no probe, 1= 1, 2= 0.5 or 3= 5) um for gage 1 to 4.
SETLGD1-4,<d>	Setup no of decimals (2-5) for gage 1 to 4.
SETLGU,<u>	Setup unit (0= mm, 1= inch i.g. values/25.4) for all gage 1-4.
SETLGN1-4,<s>	Setup neg sign (invert) on/off (0= of, 1= on) for input gage 1-4.
SETLGF1,3,<f>	Setup function on/off (0= off, 1= SUMa+b and DIFFa-b) for gage 1 or 3.
SETLGS1-4,<data>	Preset startvalue (±1234.567), i.g. mastering for input gage 1-4.
INPLGV1-4	Read actual value (functionvalue) for input gage 1 to 4.
INPLGX1-4	Read MAX value for input gage 1 to 4.
INPLGM1-4	Read MIN value for input gage 1 to 4.
INPLGW1-4	Read TIR (max - min) value for input gage 1 to 4.
INPLGE1-4	Read mean-value for input gage 1 to 4. **Note** Only **if** buffer store is done. **Note!** After 1:st buffer store, the meanvalue Ei for Vi may be read out.
INPLGS1-4	Read presetvalue for input gage 1 to 4.
CLRLGP1-4	Clears all peak values MAX, MIN and TIR (initialize) for gage 1-4.
CLRLGS1-4	Clears preset values for gage (gage pair) 1-4.
SETLGZ1-4	Sets gage 1-4 to zero.
LOAD-Trigginput	Sends: RG,<err.mask>|<v1>|<v2>|<v3>|<v4>|<countv>TAB **Note!** Tab is sent as acknowledge, and values for all four gages incl. counter are sent back regardless of gage setup.
INPTRG	Read gages and counter. Responds **exactly** as the LOAD-Trigginput.
Pulsecounter detector	Resp. = ±999999999 (integer).
SETPDZ,<c>	Setup input/mode (0= no counter, 1= on, 2= zerocount, 3= clear counter).
INPPDC	Read input counter for pulse detector 1 (one per unit). **Note!** The actual counter value is 4 x number of input pulses.
Digital I/O ports	Data and responds = 0-255 (integer).
SETDIT,<flag>	Setup input port P1:D1.7 (low->high) = external trigg out request on/off: (0= off, 1= on) If trigg, RQ,1|<portv>TAB is asynchrony send back.
SETDIO0,<data>	Set digital value (0-255) for port 0.
INPDIO0,1	Read digital (set) value (0-255) for port 0 to 1.
Analogue adc/dac	Data and responds = 0-65535 (integer).
INPADV1,2	Input analogue value for ADC 1 to 2.
INPADX1,2	Input MAX value for ADC 1 to 2.
INPADM1,2	Input MIN value for ADC 1 to 2
SETDAV,<data>	Set analogue value for DAC 1.
CLRADP1,2	Clears the analogue peak values for ADC 1 and 2.
Elapsed time	Responds = 12345678 (long integer).
INPELT	Read elapsed time (ms).

Buffered gage reading

SETBFM, <m1>,<m2>.. Setup buffered gage reading store mode (V1-4,C,T,A1-2,P max 9 char),
V1-4 = Selected actual linear gages value 1 to 4.
C = Include pulse detector count value (only one).
T = Include elapsed time.
A1-2= Include analogue input 1 or 2.
P = Input port 1.
Note1! Setup is set in combination for ex. V1,V2,C,T,A1,P, se next.
Note2! The readout order is fixed; V1-4,C,T,A1-2 and P (after setup).
Note3! An error bit mask is always stored/readout for each index.
Note4! Elapsed time is always restarting from zero after new buffer start.

INPBFD,<start>,<stop> Readout buffer table from start index to stop index.
Ex. Gage V1-2, counter, time and analogue input (error bitmask 1:st data),
Responds = ABCDh|±1234.567|±2345.678|123456789|±12345678|12345,
E (error) V1 V2 C T A1.

INPBFI Read/test current buffer index (no of elements), Resp= 0-N (long integer).

STPBFD Stops readout bufferdata (finish last datablock).
Note! The command returns **no** respond (e.g. if right or wrong format).

Continuously input

SETCIQ,<scan> Set input frequency scans (1 to 1000) Hz for buffered reading. 100 default.

STACID Start continuously input and store buffer, and start calc. of meanvalue Ei.

STPCID Stop continuously input. Lock the meanvalue for Ei.
Note! If buffer is full, error code 20 is returned after stop.

Stepmotor and I/O

Mode settings See also common I/O-connector.

SETSMA1,2,<ramp>,<feed> Setup start/stop ramp and max feed (0 to 99) motorunits for motor 1 to 2.
Note! If ramp or feed parm = 0, the entire stepmotorsystem is **deactivated** and portsignals (out/inp) are enabled for general use. When running a motor, the corresponding out bits are readout as zero.

SETSML1,2,<c> Setup stepmotor limit-controls on/off (0, 1 or 2) for motor 1 to 2:
c = 0: positive and negative limit-inputs are off (reference = off).
c = 1: positive and negative limit-inputs are active (reference = on).

Portsignals (out) PULSE and DIR (direction) for external step motor drive unit.

Portsignals (inp) *POS(+) and *NEG(–) LIMITS for step motor movements (inverted).
Note! The positive (+) and negative (-) limits, also act as reference limits.

Operating Responds = ±999999999 (integer).

INPSMC1,2 Read current position counter for motor 1 to 2.

SETSMR1,2,<r> Set runmode (0= absolute or 1= relative, one char), positioning.

SETSMC1,2,<steps> Set current (start) counter to 0 to ±999999999 steps.

STASMP1,2,<steps> Start stepmotor (free run, no data buffering), 0 to ±999999999 steps.

STASMB1,<steps> Start stepmotor **and** start buffer reading, 0 to ±999999999 steps,
and start calculate meanvalue i.g until done. Lock the meanvalue.
Note1! Buffer storing is only included for motor one.
Note2! No of steps allocates no of buffer elements.

STASMR1,2,<dir> Start step motor reference run to positive or negative limits (0= pos, 1= neg).
INP = on -> off (reverse and step slow) -> on (and stop), position sets = 0.
Note! Normally a slower speed should be setup first.

Limit over travel Motor stops (softly) and the motor status 2 (negative limit active), or
3 (positive limit active) reflects the limit switch for motor 1 or 2.

Start in limit-mode If motor status 2 or 3 is active, Resp. NG,<41 (motor is in neg. limit pos)>
or <42 (motor is in pos. limit pos)> error is returned.

STPSMP1,2 Stops step motor 1 or 2 (softly, ramp down).

INPSMP1,2 Test status for step motor 1 or 2. Resp. = 0 (ready), 1 (running), else,
2 (negative limit active) or 3 (positive limit active).
Note! Before read the status after start, always wait min 25 mS.

Error list

No	*Internal name*	*Description*
00		No error present (if read).
10	ubxIllegalCommand	Illegal command or format.
11	ubxIllegalSelection	Illegal selection number.
12	ubxIllegalParameter	Illegal parameter.
14	ubxIllegalData	Illegal parameter value.
15	ubxParityError	Parity error received.
20	ubxRBufferIsFull	Read buffer is full.
21	ubxRBufferIsEmpty	Read buffer is empty.
22		
23	ubxRBufferNotInitiated	Read buffer is not setup.
30		
31		
32	ubxProbeOrCounterNotInitated	Probe(s) or counter are not setup.
40	ubxMotorNotInitiated	Motor is not setup.
41	ubxMotorInNegLimit	Motor is in neg(-) limit pos (status 2).
42	ubxMotorInPosLimit	Motor is in pos(+) limit pos (status 3).
43	ubxMotor1BufferOverspeed	Motor speed to high for read buffer.
99	ubxInternalHardwareError	Internal hardware error.

Error mask

Bit.no	*Internal name*	*Pending*	*Description*
0	ubxProbe1_ReadError	Yes	Read error from gage 1.
1	ubxProbe2_ReadError	Yes	Read error from gage 2.
2	ubxProbe3_ReadError	Yes	Read error from gage 3.
3	ubxProbe4_ReadError	Yes	Read error from gage 4.
4	ubxCounter_ReadError	Yes	Read error from counter.
5, 6, 7	Spare		
8	ubxProbe1_Missing	Yes	Probe 1 is missing.
9	ubxProbe2_Missing	Yes	Probe 2 is missing.
10	ubxProbe3_Missing	Yes	Probe 3 is missing.
11	ubxProbe4_Missing	Yes	Probe 4 is missing.
12	ubxCounter_Missing	Yes	Counter is missing.
13, 14	- - -		Only for UBXi16 unit.
15	Not used		

Note! The error mask is cleared (reinitialized) by the CLRERR command.

Common I/O

Connector pins Connector: 37p DSUB female (screw locking).

1, 20:	+24V external supply.			
2:	D0.0 (Output port 0)	= STEP	(stepping) for motor 1.	
3:	D0.1	= DIR	(direction) for motor 1.	**1)**
4:	D0.2	= STEP	(stepping) for motor 2.	
5:	D0.3	= DIR	(direction) for motor 2.	**1)**
6:	D0.4			
7:	D0.5			
8:	D0.6			
9:	D0.7			
21:	D1.0 (Input port 1)	= *POS(+) LIMIT (and reference) for motor 1.		
22:	D1.1	= *NEG(–) LIMIT (and reference) for motor 1.		
23:	D1.2	= *POS(+) LIMIT (and reference) for motor 2.		
24:	D1.3	= *NEG(–) LIMIT (and reference) for motor 2.		
25:	D1.4			
26:	D1.5			
27:	D1.6			
28:	D1.7	= SEND RQ (input request, positive flank)		
10,29:	0V external supply.			
11,30	NC			
12,31:	+5V pulsedetetctor power supply.			
13:	phase A (pos)			
32:	phase A (neg)			
14:	phase B (pos)			
33:	phase B (neg)			
15:	Zeropulse (pos)			
34:	Zeropulse (neg)			
35,36:	NC			
16:	ADC1 0 - 5V analogue input			
17:	ADC2 0 - 5V.			
18:	DAC1 0 - 5V analogue output.			
19,37:	GND (computer)			

1) The DIR-signal is low for positive (+) movements and high for negative (–).