



HBLS handwheel



REF. 1509

**HBLS HANDWHEEL**

Ref. 1509



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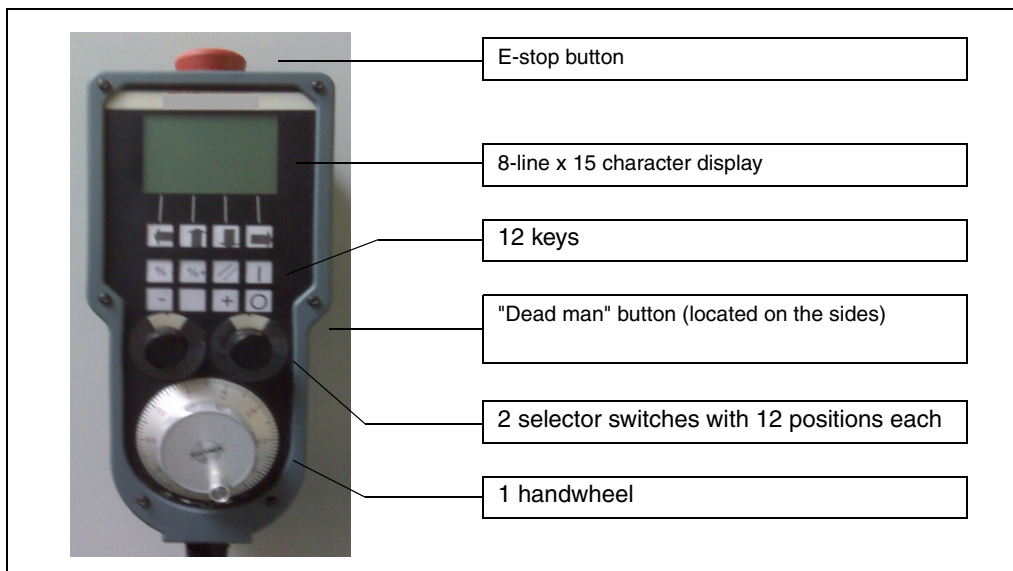


HBS  
handwheel

# CHARACTERISTICS AND CONNECTION

# 1

The HBL5 is a 100 pulses/turn handwheel that also comes with:



The following requirements must be met in order for this handwheel to work with an 8065 CNC or an 8070 CNC:

- The CNC software version must be V4.10 or newer.
- The central unit must have a serial port that may be configured for an RS422. To make sure that it has this port, check that "Base" section of the <DIAGNOSIS / CNC8070-ETX> screen shows the value 1.8.2.

## HBL5 handwheel characteristics

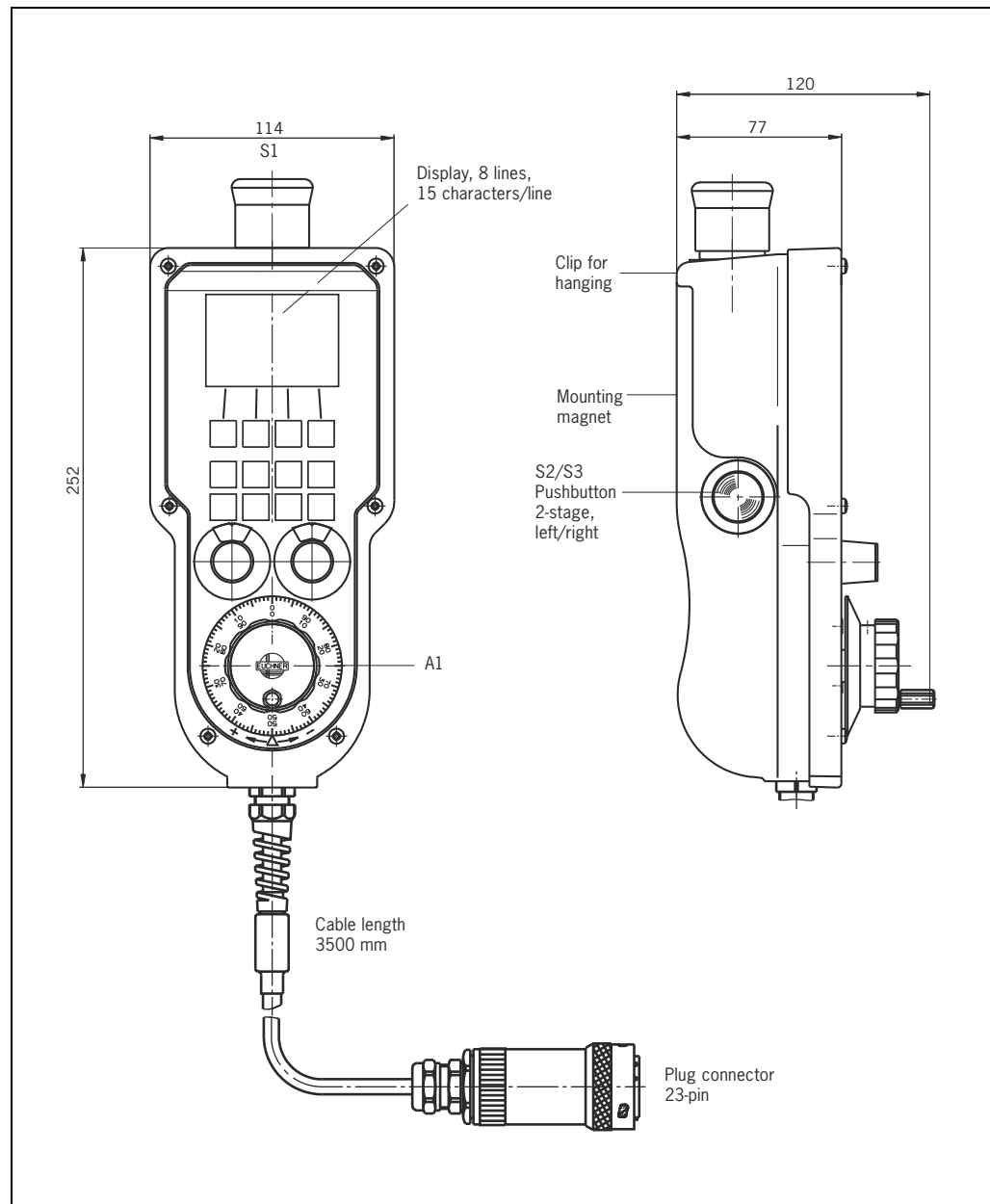
Operating temperature:	Between 0 °C (32 °F) and 50 °C (122 °F)
Storage temperature:	Between -20 °C (-4 °F) and +70 °C (158 °F)
Operating relative humidity:	80%
Storage relative humidity:	90%
Degree of protection:	IP65
Connection:	3.5m cable and 23-pin connector
Weight:	2.2 kg
Interface type:	RS422
Operating voltage $U_B$ :	24 ±20% V DC
Maximum operating current:	200 mA
Outputs with galvanic isolation:	A, /A, B, /B
Pulses per turn:	100



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## 1.1 HBLS handwheel dimensions

The handwheel dimensions are:



1.

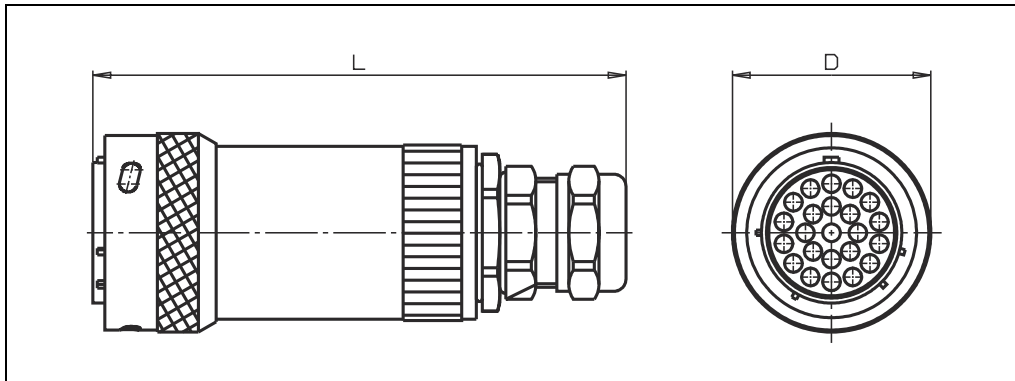
**CHARACTERISTICS AND CONNECTION**  
HBLS handwheel dimensions



**HBLS**  
handwheel

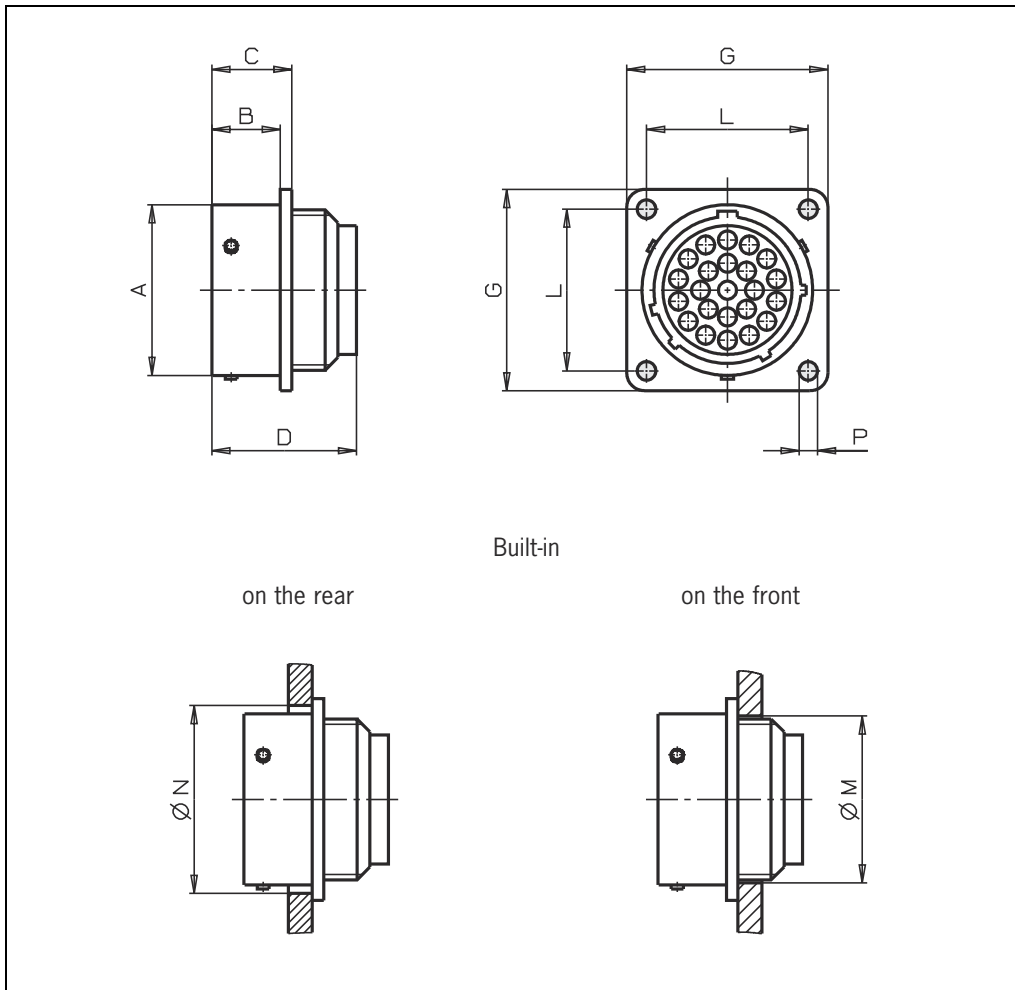
## 1.2 Connectors

### Male connector:



Number of pins	D	L	Cable diameter
23	33.9	91	6.0 - 10.0

### Female connector:



Number of pins	A	Bmax	Cmax	Dmax	Gmax	L	M	N	P
23	28.5	11.4	13.3	24.1	33.6	27	27.8	31.3	3.1

1.

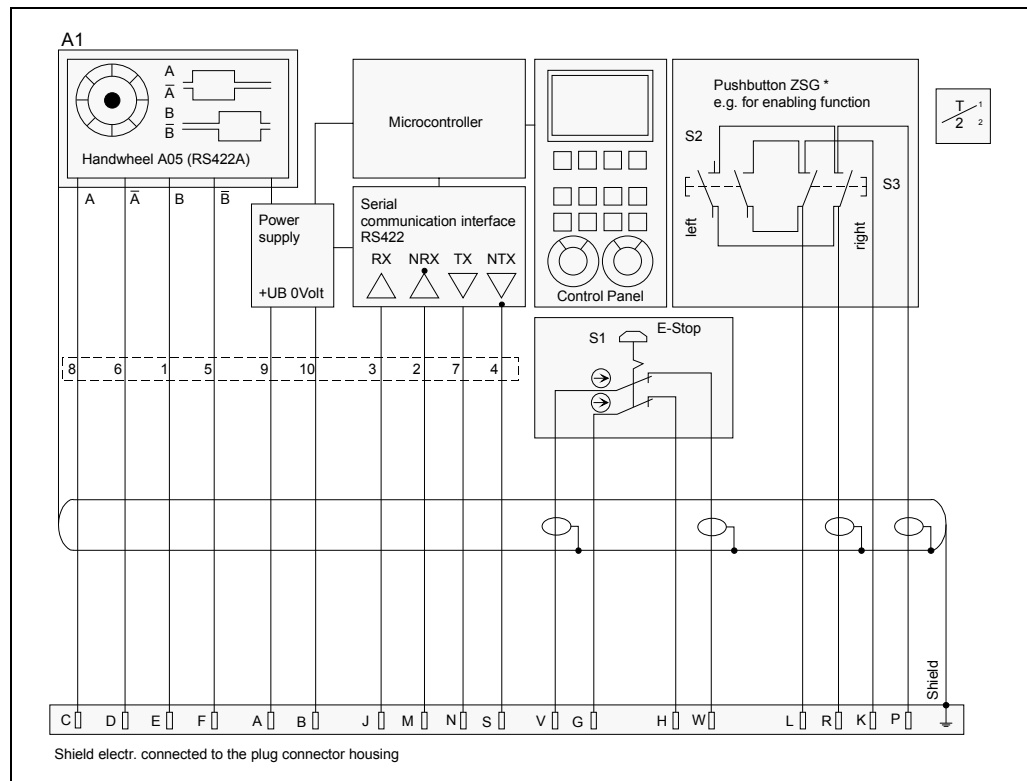
CHARACTERISTICS AND CONNECTION  
Connectors



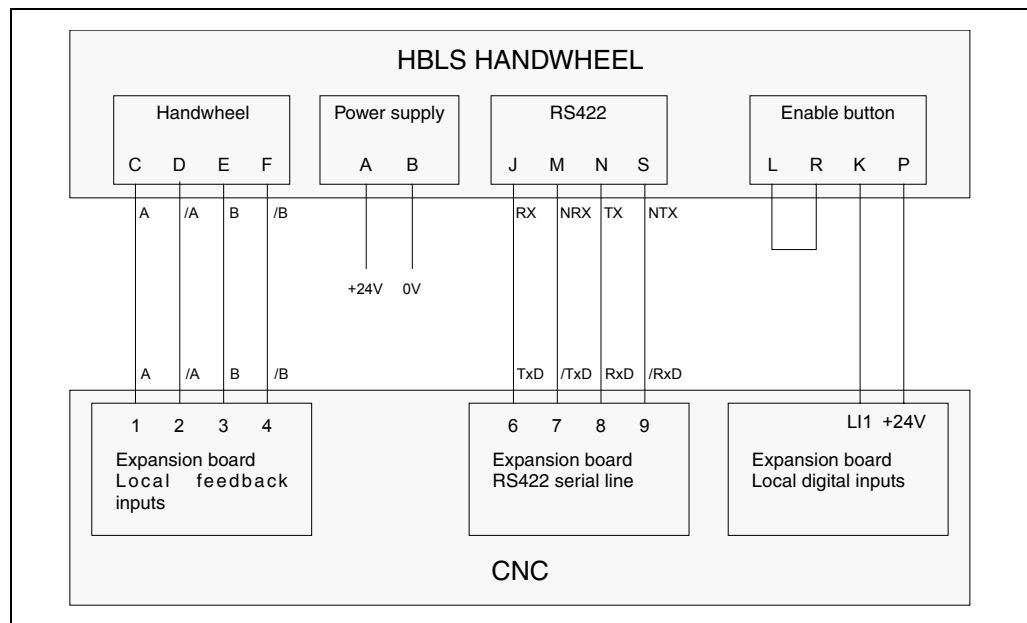
HBL5  
handwheel

### 1.3 Connection

The following figure shows the internal diagram of the HBLS handwheel.



The HBLS handwheel must be connected to the CNC as shown in the next figure.



1.

CHARACTERISTICS AND CONNECTION  
Connection



HBLS  
handwheel



# PARAMETER SETTING AND START-UP

# 2

## 2.1 Parameter setting

### 2.1.1 HBLs handwheel parameter setting

- Communication speed.  
Select the OFF position at the internal dipswitch S1.  
OFF = 19200 baud.  
ON = 9600 baud
- Screen brightness adjustment  
It is adjusted with a potentiometer inside the handwheel.

### 2.1.2 CNC parameter setting

- General parameters:  
RSTYPE = RS422 (restart Windows to assume the change).  
CHTYPE = CNC + PLC (in the channels to be controlled with the handwheel).  
RETRACEAC = YES (to activate the retrace in the FEED handwheel mode).
- Manual parameters:  
NMPG = Configure at least one handwheel.  
COUNTERTYPE = Define like any other normal handwheel.  
COUNTERID = Define like any other normal handwheel.  
HBLs = YES (sets the serial communication with the HBLs handwheel).
- Communication speed set in the file "hbls.ini":  
Copy the file "hbls.ini" into the folder "C:/CNC8070/MTB/MMC/Config".

File "hbls.ini":

```
[COMM]
PORT = COM1
BAUDRATE = 19200
STOPBITS = 1
PARITY = 2
FLOWCONTROL = 1
```

If Windows has set a value other than COM1 to the serial port of the CNC, it may be changed in the control panel of Windows or the "hbls.ini" file may be modified.



HBLs  
handwheel

## 2.2 Integration into the PLC

For the PLC to manage the handwheel, the following must be integrated:

1. Add the hbls.c file to the plc folder, this file contains the HBLs function that manages the handwheel.
2. Add in the PLC program (file.plc) the necessary code lines to operate with the handwheel.

### Example of lines to be added to the PLC program (file.plc)

```

EXTERN HBLs                ; Indicates that the HBLs function is in another file

; Example of some signals to communicate with the HBLs function of hbls.c
DEF HBLs_ENABLE M1600
DEF HBLs_RESET_CONFIG M1601    ; =1 Resets the handwheel configuration
DEF HBLs_STOPC1 M1610
DEF HBLs_STARTC1 M1611
DEF HBLs_RESETEINC1 M1612
DEF HBLs_RAPIDC1 M1614
DEF HBLs_PANELOFF1 M1615      ; To disable the keyboard from the PLC while the
                                handwheel is enabled.

DEF HBLs_PLCCNTL1 M1701
DEF HBLs_PLCCNTL2 M1702

; Within the PRG module
PRG

; Dead-man button connected to LI1, enables the movements from the HBLs handwheel
LI1 = HBLs_ENABLE

; Call to the HBLs function
() = CAL HBLs
HBLs_RAPIDC1 = MANRAPIDC1      ; Move in rapid when selected from the
                                handwheel
STARTC1 OR HBLs_STARTC1 = CYSTARTC1 ; Program the start button of the handwheel
... AND HBLs_STOPC1 = _STOPC1      ; Add the handwheel stop button condition
... OR HBLs_RESETEINC1 = RESETEINC1 ; For the RESET button of the handwheel to
                                work
... OR HBLs_PLCCNTL = PLCCNTL1     ; Necessary to move the spindle with the
                                handwheel
; hbls.c also writes the velocity command in SANALOG when enabling HBLs_PLCCNTL
END

```

### PLC signals for axes and channels used inside the hbls.c file

At the beginning of the hbls.c file there is a list of "defines" that configure the signals for all the axes and channels that are used inside the file itself.

In any of these signals is not to be used in the PLC program, replace it in the define fo hbls.c with an unused PLC mark and than add it to the logic of the PLC program.

```

RETRACE
SBLOCK
AXISPOS
AXISNEG

```

# 2.

## 2.3 PLC texts, messages and errors

Inside the hbls.c file there are 2 text tables that may be customized by the OEM with the texts to be displayed with each PLC message and error.

They must not exceed 15 characters per line of the handwheel screen.

- The following lines must configure the number of messages and errors that each table contains. If not configured, An error will be issued when generating the PLC.

```
#define HBL5_PLCSMSG 3
#define HBL5_PLCCERR 3
```

- After this, there are 2 tables with texts, one for the messages and another one for the errors:

```
static struct plcME_st plcMSG[HBL5_PLCSMSG+1] =
{
    _T(""), Not being used
    _T(" 1 No power"), //MSG1
    _T(" 2 Hydra.level "), //MSG2
    _T(" 3 PLC MSG3  "), //MSG3
};

static struct plcME_st plcERR[HBL5_PLCCERR+1] =
{
    _T(""), // Not used
    _T(" 1 PLC ERR1  "), //ERR1
    _T(" 2 PLC ERR2  "), //ERR2
    _T(" 3 PLC ERR3  "), //ERR3
};
```

The characters that may be written in these texts are:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
8		!	"	#	\$	z	&	'	(	)	*	+	,	-	.	/
9	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
A	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
B	'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
C	p	q	r	s	t	u	v	w	x	y	z	<		>	~	
D	ç	ü	é	â	ä	à	ç	ê	ë	è	ï	î	ì	ñ		
E	é	z		ô	ö	ò	û	ù	ÿ	ö	ü	ç	£	¥		f

# 2.

PARAMETER SETTING AND START-UP  
PLC texts, messages and errors



HBL5 handwheel

## 2.4 Customizing the OEM screen

The HBL5 handwheel offers a screen where the OEM can personalize the text to be displayed in each line up to a total of 32 lines.

Each line may display a fixed text on the left.

It can show one of the following operations on the right:

- The value of a PLC register.
- A text from 2 that is selected by activating a bit of a PLC register.

The OEM can change the numbers of the registers. All the lines use the same register for the same function, bit 0 for line 1, bit 1 for line 2, .... bit 31 for line 32.

- They activate the bit for the line of the PLC register.

```
#define OEM_MINUSR650 // -/M4 pressed on OEM screen.
#define OEM_MIDDLER651 // M5 pressed on OEM screen.
#define OEM_PLUSR652 // +/M3 pressed on OEM screen.
```

- They activate from the PLC the display of the text on the right side of the screen, each bit is the text corresponding to its line.

```
#define OEM_STATUS_1 R655 // Example: Text "ON" in the first line
#define OEM_STATUS_2 R656 // Example: Text "OFF" in the first line
```

In the lines that display a PLC register on the right, if the OEM\_STATUS\_1 bit is 1, it displays the value and if it is 0, it displays blank spaces.

- Sets the maximum number of characters of the text of the left side to align the text of the right side

```
#define OEM_LENGTH 11
```

- It defines the number of OEM lines (up to 32). The exact number must be configured; otherwise, an error will be issued when generating the PLC.

```
#define OEM_N 10
```

### Function of the keys

---

#### **Up and down arrow keys:**

The up and down arrow keys select the line affected by the keys and highlighted in reverse video.

#### **-/M4, M5, +/M3 keys:**

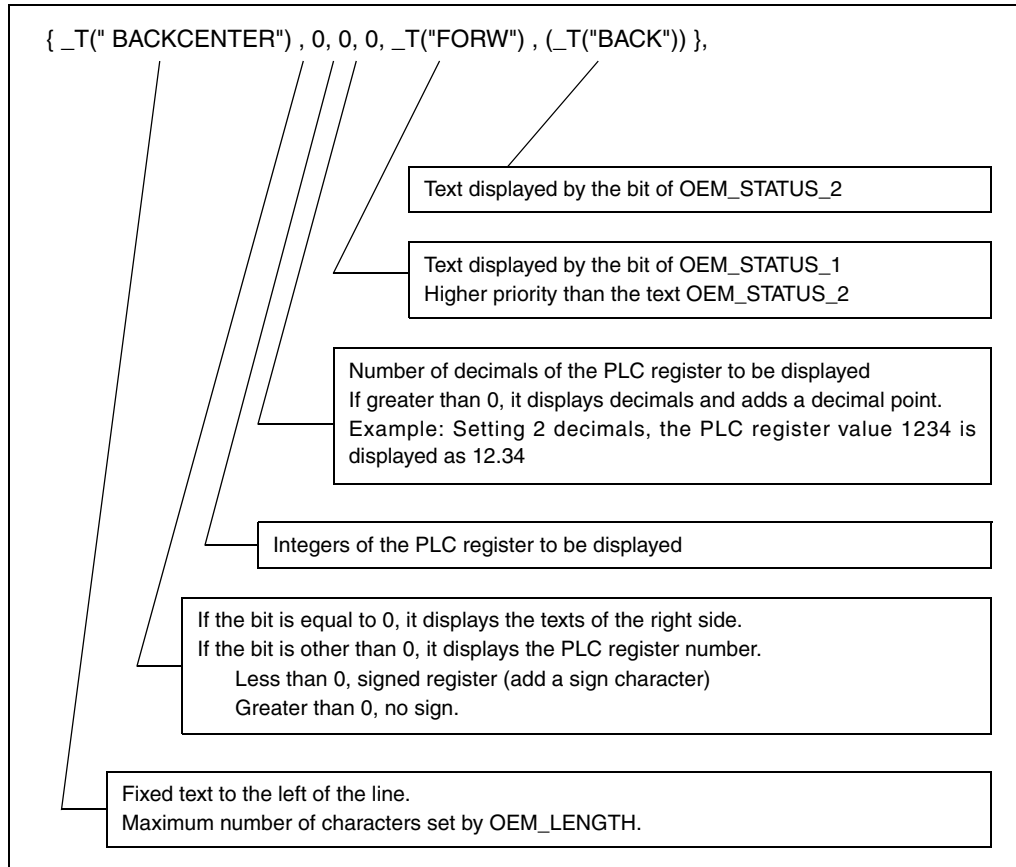
These keys at the OEM's disposal for programming PLC operations depending on the selected line.

They activate the bit of a PLC register for that line.

# 2.

## Line structure

```
static struct oem_st oem[OEM_N] =
{
    { _T(" TOOL CLAMP"), 0, 0, 0, _T(" ON "), (_T(" OFF")) },
    { _T(" BACKCENTER"), 0, 0, 0, _T("FORW"), (_T("BACK")) },
    { _T(" BRIDGE  "), 0, 0, 0, _T("UP  "), (_T("DOWN")) },
    { _T("          "), 0, 0, 0, _T("RIGH"), (_T("LEFT")) },
    { _T(" PIVOTTABLE"), 0, 0, 0, _T("LOCK"), (_T("UNLO")) },
    { _T(" CHUCK  "), 0, 0, 0, _T("CLAM"), (_T("UNCL")) },
    { _T(" MAGAZ.POS ") ,20, 4, 0, _T("  "), (_T("  ")) },
    { _T(" SPDL%TOR")  ,-30, 3, 1, _T("  "), (_T("  ")) },
    { _T("          "), 0, 0, 0, _T("  "), (_T("  ")) },
    { _T("          "), 0, 0, 0, _T("  "), (_T("  ")) }
};
```



# 2.

**PARAMETER SETTING AND START-UP**  
Customizing the OEM screen



**HBLS**  
handwheel

2.

**PARAMETER SETTING AND START-UP**

Customizing the OEM screen

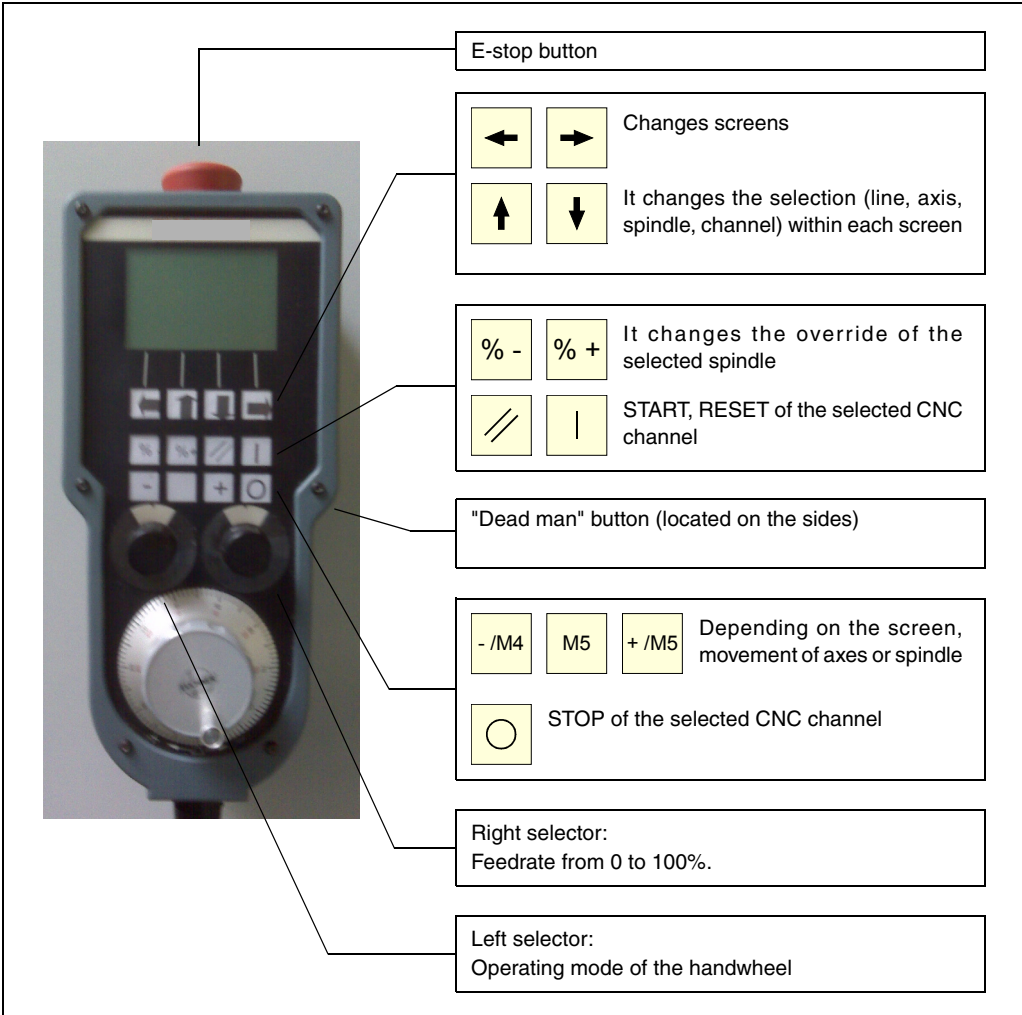


HBL5  
handwheel

3.1 General view

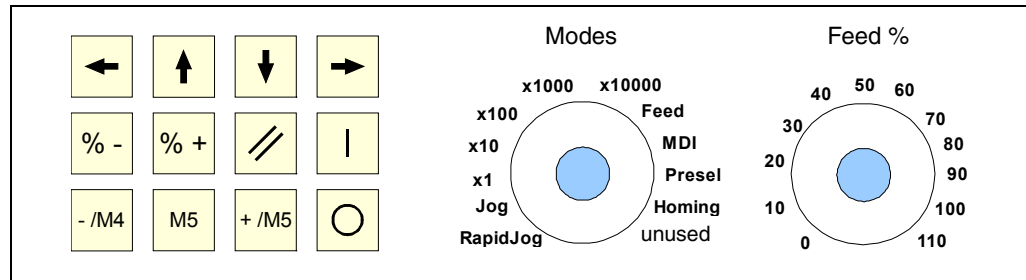
The HBL5 handwheel comes with:

- E-stop button
- Enable button (dead man)
- 8-line x 15 character display.
- 12 keys
- 2 selector switches with 12 positions each
- 1 handwheel



HBL5 handwheel

## 3.2 Keys and switches of the handwheel



### 3.2.1 Keys

#### **Left and right arrows:**

Change of display screen

#### **Up and down arrows**

Depending on the selected screen, it changes the axis, spindle, channel, writes/deletes a character in MDI.

#### **Start:**

Start for the channel selected on the screen.  
It executes the MDI line in the selected channel.  
It executes the home search on the selected axis.  
It executes G92 (preset of the selected axis).

#### **Stop:**

It interrupts the execution of a program in automatic mode.

#### **Reset:**

It resets the selected CNC channel.

#### **%+:**

It increases the speed override of the selected spindle.

#### **%-:**

It decreases the speed override of the selected spindle.

#### **- / M4:**

In continuous jog mode or in incremental jog mode, it moves the selected axis.  
In spindle mode, it turns the spindle clockwise.

#### **M5:**

In continuous jog mode, it moves the selected axis in rapid.  
In spindle mode, it stops the spindle.

#### **+ / M3:**

In continuous jog mode or in incremental jog mode, it moves the selected axis.  
In spindle mode, it turns the spindle counterclockwise clockwise.

#### **Enable button (ENABLE):**

It allows the movement of the axes and the START key.  
Pressing the ENABLE enables the feedrate override from the handwheel switch.  
Releasing the ENABLE enables the feedrate override from the CNC.  
Releasing the ENABLE button generates a stop button that interrupts the execution of the program.

# 3.

OPERATION  
Keys and switches of the handwheel



### 3.2.2 Left selector

#### **RAPIDJOG and JOG**

The + and - move the selected axis in rapid JOG and JOG.

It only works when displaying an axis screen (G53..G92, MCS, FLWE).

#### **X1**

The + and - move the selected axis x1 in incremental jog.

The handwheel moves the axis x1.

#### **X10**

The + and - move the selected axis x10 in incremental jog.

The handwheel moves the axes x10.

#### **X100**

The + and - move the selected axis x100 in incremental jog.

The handwheel moves the axes x100.

#### **X1000**

The + and - move the selected axis x1000 in incremental jog.

#### **X10000**

The + and - move the selected axis x10000 in incremental jog.

#### **FEED**

Handwheel in feed mode. Turning the handwheel changes the feedrate % of the channel between 0 and the feedrate override selected at the right selector.

Turning the handwheel CCW, the program retraces using the RETRACE function of the CNC.

#### **MDI**

Line 7 of the handwheel screen no longer shows the feedrate in order to edit the line to be executed in MDI in the selected channel.

- Turning the handwheel changes the command or number to write.  
Commands: G, F, M, H, T, D, axis names, system spindle names.
- The down arrow key writes the command or number and jumps to the next character.
- The up arrow key deletes the last character or number.
- The first character to be written is a command. Pressing the down arrow writes the command and jumps to the next character with a numb.
- When a number is written, the next one will be a number. To switch from number to command, write a blank space " ".
- Once the instruction is completed, press START to execute it.
- The -/M4 and +/M3 keys change the channel where the MDI instruction is to be executed.

#### **PRESET**

It is only used on the screen for part coordinates G53..92.

- Line 7 shows the G92 command of the selected axis with a 0 coordinate by default.
- At first, the up and down arrow keys select the axis.
- For a coordinate other than 0, turn the handwheel to write the desired one. The up and down arrow keys may be used to select the axis to work like in MDI mode and write the coordinate.
- Press START to execute the command.

# 3.

OPERATION  
Keys and switches of the handwheel

**FAGOR** 

**HBL5**  
handwheel

## **HOMING**

Line 7 shows the G74 command of the selected axis.

- It is only used on the screens: G53..92, MCS and FLWE.
- The up and down arrow keys select the axis to be homed.
- Press START to execute the command.

# 3.

## OPERATION

Keys and switches of the handwheel

### **3.2.3 Right selector**

Percentage to be applied to the programmed axis feedrate or spindle speed (override).

### 3.3 Screens

#### 3.3.1 General information

G	5	3				S	B	C	1	M	A	N	U	A	L
F		6	0	0	0	m	m	/	m	i	%	1	0	0	
J	O	G							R	e	a	d	y		

**Line 1:**

G	5	3				S	B	C	1	M	A	N	U	A	L
---	---	---	--	--	--	---	---	---	---	---	---	---	---	---	---

A
B
C
D

**A.** To the left of the line, in 5 characters, it indicates the screen on display. The various screens are:

- G53..92      Axis part-coordinate
- MCS          Axis machine-coordinate
- FLWE        Following error of the axes
- SPDL        Information on the selected spindle
- HIST.        History of the selected channel
- FEED.       Programmed feedrate of the channel
- OEM          Screen that may be configured by the OEM
- MSG          Active PLC messages (text customized by the OEM)
- ERR          Active PLC errors (text customized by the OEM)

**B.** It indicates whether the single-block mode is selected in the channel or not. Otherwise, this section will be blank.

**C.** It indicates the displayed channel, the operations of the handwheel affect the channel indicated in this section.

**D.** It indicates whether the channel is in jog or automatic mode.

**Lines 2 through 6:**

Show data related to the screen selected in line 1.

**Line 7:**

F		6	0	0	0	m	m	/	m	i	%	1	0	0	
---	--	---	---	---	---	---	---	---	---	---	---	---	---	---	--

It shows the real feedrate of the channel, highlighted, if FEEDHOL = 0.

If any of the MDI, PRESET or HOMING modes is selected with the left selector switch, it shows the line edited to be executed by pressing START.

# 3.

OPERATION  
Screens



HBL5  
handwheel

**Line 8:**

J	O	G					R	e	a	d	y			
---	---	---	--	--	--	--	---	---	---	---	---	--	--	--

On the left, it indicates the position of the left selector switch.

On the right, it indicates the status of the CNC channel:

Ready	Channel ready
Execut.	Channel in execution
RESET	Channel RESET in progress
Int.M00	Channel interrupted by an M0 in the program
Interr.	Channel interrupted by the STOP key
Int.SBLK	Channel in single-block mode, execution of current block completed
E6004	The CNC error with highest priority

**3.**

**OPERATION**  
Screens

### 3.3.2 G53..92 part coordinate, MCS machine coordinate, FLWE following error

Screen that shows information about the axes.

G	5	3			S	B	C	1	M	A	N	U	A	L
-	X					-	3	2	.	0	0	0	m	m
-	Y						1	0	.	0	0	0	m	m
+	Z						4	0	.	0	0	0	m	m
?	B					-	1	8	0	.	0	0	g	r
?	C							0	.	0	0	0	g	r
F		6	0	0	0	m	m	/	m	i	%	1	0	0
J	O	G						R	e	a	d	y		

**Line 1:**

The first line of the G53..92 screen shows the offset active in the selected channel.

**Lines 2 through 6:**

-	X					-	3	2	.	0	0	0	m	m
-	Y						1	0	.	0	0	0	m	m
+	Z						4	0	.	0	0	0	m	m
?	B					-	1	8	0	.	0	0	g	r
?	C							0	.	0	0	0	g	r



**A.** Depending on the symbol displayed, it indicates the following:

- s: Indicates that the axis is set as slave of a Gantry or Tandem axis.
- ?: The axis is not enabled (SERVOON).
- +: The axis is moving in the positive direction.
- : The axis is moving in the negative direction.

**B.** They show the axes of all the CNC channels.

## Functions of the keys, switches and handwheel

**Up and down arrow keys:**

They select the highlighted axis. If there are more than 5 axes in the configuration, it scrolls them.

**+/M3 and -/M4 key:**

In JOG and JOGRAPID, they move the selected axis in continuous jog mode.  
 In X1, X10, X100, X1000, X10000 they move the axis in incremental jog mode.

**Movement with handwheel:**

X1, X10, X100.



HBLS handwheel

### 3.3.3 SPDL. Spindle

Screen that shows information about the spindle.

S	P	D	L				C	1	M	A	N	U	A	L
S		:	M	0	5	M	4	1			%	1	0	0
S	P	R	O	G	1	2	3	4	5			R	P	M
C	S	S			1	2	.	1	2		m	/	m	i
S	R	E	A	L	1	2	3	4	5			R	P	M
S	P	O	S	-	1	2	3	.	1	2	3	4	g	r
F		6	0	0	0	m	m	/	m	i	%	1	0	0
J	O	G					R	e	a	d	y			

**Line 2:**

S		:	M	0	5	M	4	1			%	1	0	0
---	--	---	---	---	---	---	---	---	--	--	---	---	---	---

It shows information about the spindle.

**Line 3:**

S	P	R	O	G	1	2	3	4	5			R	P	M
---	---	---	---	---	---	---	---	---	---	--	--	---	---	---

It indicates the S programmed in G97.

**Line 4:**

C	S	S			1	2	.	1	2		m	/	m	i
---	---	---	--	--	---	---	---	---	---	--	---	---	---	---

It indicates the S programmed in G96.

**Line 5:**

S	R	E	A	L	1	2	3	4	5			R	P	M
---	---	---	---	---	---	---	---	---	---	--	--	---	---	---

It indicates the following:

- RPM when it is in M5, M3, M4.
- degrees/min when it is in M19.

**Line 6:**

S	P	O	S	-	1	2	3	.	1	2	3	4	g	r
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

It indicates the spindle position.

## Functions of the keys, switches and handwheel

**Up and down arrow keys:**

They select the spindle to display from all the spindles of the CNC.

**+M3, M5 and -M4 key:**

They execute M3, M5 or M4 at the spindle displayed on the screen.

**Spindle movement with handwheel:**

If the selector is in X1, X10 or X100, the spindle must be in M05 and the movement is without position loop.

3.

OPERATION  
Screens



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### 3.3.4 HIST. Channel history

Screen that shows the history of the selected channel.

H	I	S	T	.			C	1	M	A	N	U	A	L
S		:	M	0	5	M	4	1			%	1	0	0
S	R	E	A	L	1	2	3	4	5			R	P	M
G	9	4	G	9	7	M	0	8						
G	5	3	G	0	0	G	1	7	G	7	1	G	9	0
T		1	D		1				N	T		1		
F		6	0	0	0	m	m	/	m	i	%	1	0	0
J	O	G					R	e	a	d	y			

#### **Lines 2 and 3:**

They show information about the main spindle of that channel. If there is no spindle in that channel, the lines appear blank.

#### **Lines 4, 5 and 6:**

They show the history of the selected channel.

### **Function of the keys**

---

#### **Up and down arrow keys:**

They select the channel to be displayed.

#### **M5 Key:**

It activates or cancels the single-block mode in the channel.

### 3.3.5 FEED. Programmed feedrate of the channel

Screen that shows the feedrate programmed in the selected channel.

F	E	E	D				C	1	M	A	N	U	A	L
G	9	4												
F	P	R	O	G	1	2	3	4	5	m	m	/	m	i
G	9	5												
F	P	R	E	V	1	2	.	1	2	m	m	/	r	e
F		6	0	0	0	m	m	/	m	i	%	1	0	0
J	O	G					R	e	a	d	y			

**Lines 2 through 5:**

G	9	4												
F	P	R	O	G	1	2	3	4	5	m	m	/	m	i
G	9	5												
F	P	R	E	V	1	2	.	1	2	m	m	/	r	e

They show the feedrate programmed in the selected channel.

**Lines 6 and 7:**

When selecting MDI with the left switch, the F display switches from line 7 to line 6.

#### Function of the keys

---

**Up and down arrow keys:**

They select the channel to be displayed.

**M5 Key:**

It activates or cancels the single-block mode in the channel.



HBL5 handwheel



### 3.3.6 OEM. Screen that may be configured by the OEM

Screen at the OEM's disposal for programming PLC operations depending on the selected line.

O	E	M						C	1	M	A	N	U	A	L	
T	O	O	L										L	O	C	K
T	O	O	L	M	A	G	.	P	O	S				2	3	
L	U	B	R	I	C	A	T	I	O	N				O	N	
L	I	G	H	T										O	F	F
F		6	0	0	0	m	m	/	m	i	%	1	0	0		
J	O	G						R	e	a	d	y				

**Lines 2 through 6:**

T	O	O	L										L	O	C	K
T	O	O	L	M	A	G	.	P	O	S				2	3	
L	U	B	R	I	C	A	T	I	O	N				O	N	
L	I	G	H	T										O	F	F

Each line may display a fixed text on the left.

It can show one of the following operations on the right:

- The value of a PLC register.
- A text from 2 that is selected by activating a bit of a PLC register.

### Function of the keys

**Up and down arrow keys:**

They select the line affected by the keys and highlighted in reverse video.

**-/M4, M5, +/M3 key:**

They execute M3, M5 or M4.



HBL5 handwheel

### 3.3.7 MSG, ERR. Active PLC messages and errors

Screen that shows the active PLC messages and errors.

M	S	G					C	1	M	A	N	U	A	L
	1	F	a	l	t	a	P	o	t	e	n	c	i	a
	5	N	i	v	e	l	H	i	d	r	a	u	l	.
F		6	0	0	0	m	m	/	m	i	%	1	0	0
J	O	G					R	e	a	d	y			

**Lines 2 through 6:**

	1	F	a	l	t	a	P	o	t	e	n	c	i	a
	5	N	i	v	e	l	H	i	d	r	a	u	l	.

They show the active PLC messages and errors.

The text may be configured by the OEM.



HBL5  
handwheel



HBLS  
handwheel



HBL5  
handwheel