K-DUCER

KDU1A

Torque range: 0.1 - 70 Nm

OPERATOR MANUAL

IDENTIFICATION DATA OF THE MANUFACTURER

KOLVER S.r.l.
VIA M. CORNER, 19/21
36016 THIENE (VI) ITALIA

IDENTIFICATION DATA OF THE PRODUCT

MODEL:	KDU-1A
CODE:	035001/A

TECHNICAL DATA OF THE PRODUCT

FUSE: 3,15 A
DIMENSIONS: 190 x 205 x h120 mm WEIGHT: 2,5 Kg
POWER SUPPLY: 90÷260 V AC 50÷60 Hz
TENSION: 40V DC
POWER: 600W

DECLARATION OF CONFORMITY

CE

KOLVER S.r.l. declares that the new tool here described: control unit model KDU-1A is in conformity with the following standards and other normative documents: 2006/42/CE, LVD 2014/35/UE, EMCD 2014/30/UE, EN 62841-2-2:2014, EN 62841-1: 2015, EN 60204-1, EN 61000-6-2, EN 61000-6-4.
It is also in conformity with III normative (2011/65/UE and following 2015/863).

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Position: General Manager
Person authorized to compile the technical file in Kolver

Thiene, January 1st 2022

Giovanni Colasante

Table of Contents

INTRODUCTION

K-DUCER is the new class A intelligent transducerized assembly system from Kolver. Thanks to a sophisticated control system, the electronic circuit communicates with KDS series screwdriver equipped with integrated torque/angle transducer and allows to stop the screwdriver instantly when reaching the preset torque or angle.

The AC 90÷260V - 50÷60Hz power supply is converted into 40VDC required by the KDS series screwdrivers through a switching board.

IMPORTANT: K-DUCER is a highly accurate unit but it is critically important to select the appropriate settings to ensure that the desired and proper torque is being applied and that the screwdriver motor works efficiently. Read the menu description carefully and if unsure please contact Kolver for support.

MODELS

K-DUCER power supply and control units are available in one version:

Code	Model	Features
035001/A	KDU-1A	total job options, serial and USB ports + RJ45 connector, provoding Modbus TCP (server) communication protocol and Open Protocol v1.6rev3

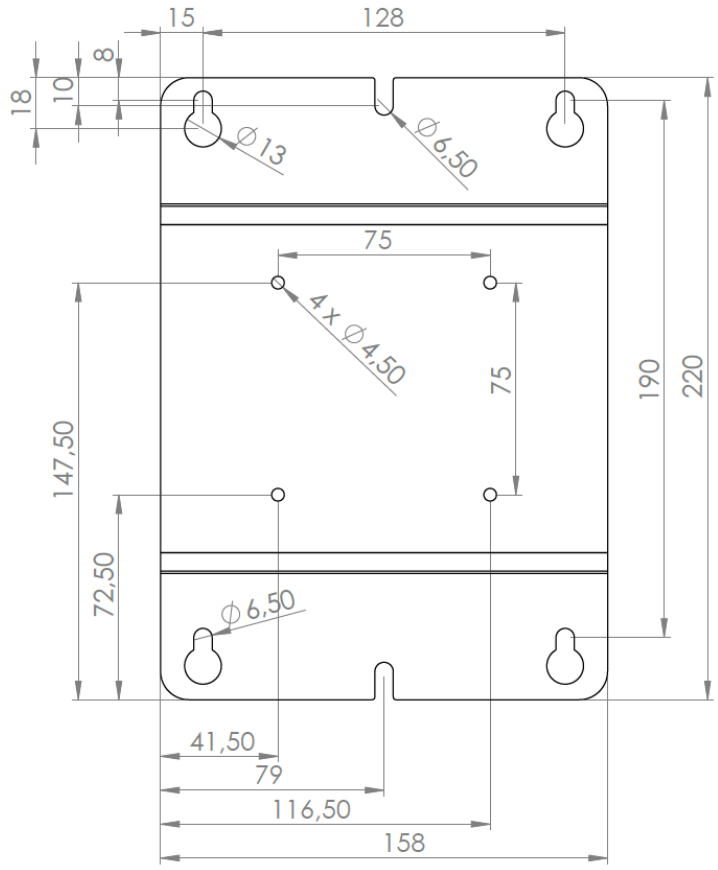
K-DUCER units are compatible with any of the KDS electric screwdrivers with transducer, available in straight, pistol and fixture configuration.

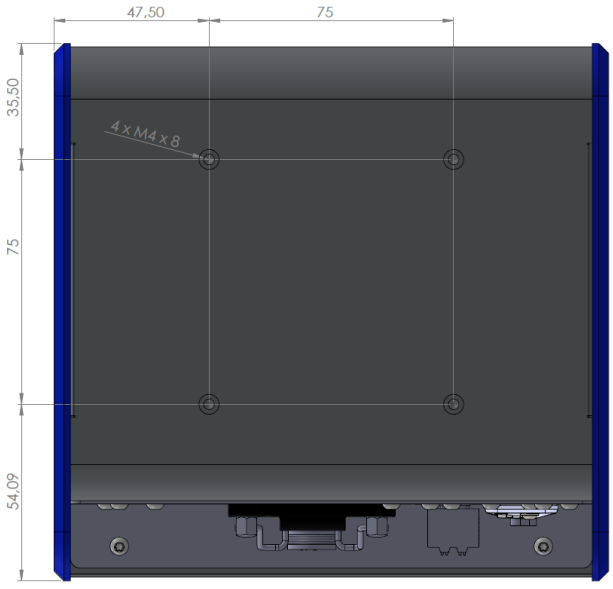
Code	Model	Torque (Nm)	Speed (rpm)	
			Min	Max
175015	KDS-MT1.5	0,1-1,5	50	850
175015/ESD	KDS-MT1.5/ESD	0,1-1,5	50	850
175016/ESD	KDS-MT1.5P	0,1-1,5	50	850
175016/U/ESD	KDS-MT1.5P/U	0,1-1,5	50	850
175115	KDS-MT1.5CA	0,1-1,5	50	850
175115/FN	KDS-MT1.5CA/FN	0,1-1,5	50	850
175015/A	KDS-MT1.5ANG	0,1-1,5	50	850
135006	KDS-PL6	0,5-6	50	850
135006/ESD	KDS-PL6	0,5-6	50	850
135007/ESD	KDS-PL6P	0,5-6	50	850
135007/U/ESD	KDS-PL6P/U	0,5-6	50	850
135106	KDS-PL6CA	0,5-6	50	850
135106/FN	KDS-PL6CA/FN	0,5-6	50	850
135006/A/ESD	KDS-PL6ANG	0,5-5,5	50	850
135010	KDS-PL10	0,8-10	50	600
135010/ESD	KDS-PL10	0,8-10	50	600
135011/ESD	KDS-PL10P	0,8-10	50	600
135011/U/ESD	KDS-PL10P/U	0,8-10	50	600
135110	KDS-PL10CA	0,8-10	50	600
135110/FN	KDS-PL10CA/FN	0,8-10	50	600
135010/A/ESD	KDS-PL10ANG	0,8-9	50	600
135015	KDS-PL15	0,5-15	50	320
135015/ESD	KDS-PL15	0,5-15	50	320
135016/ESD	KDS-PL15P	0,5-15	50	320
135016/U/ESD	KDS-PL15P/U	0,5-15	50	320
135115	KDS-PL15CA	0,5-15	50	320
135115/FN	KDS-PL15CA/FN	0,5-15	50	320
135015/A/ESD	KDS-PL15ANG	0,5-12	50	320
135020	KDS-PL20	2-20	20	210
135120	KDS-PL20CA	2-20	20	210
135120/FN	KDS-PL20CA/FN	2-20	20	210
135030/ANG	KDS-PL30ANG	3-30	20	140
135035	KDS-PL35	3-35	20	140
135135	KDS-PL35CA	3-35	20	140
135135/FN	KDS-PL35CA/FN	3-35	20	140
135045/ANG	KDS-PL45ANG	4-45	20	90
135050	KDS-PL50	5-50	20	90
135150	KDS-PL50CA	5-50	20	90
135150/FN	KDS-PL50CA/FN	5-50	20	90
135070/ANG	KDS-PL70ANG	7-70	20	50

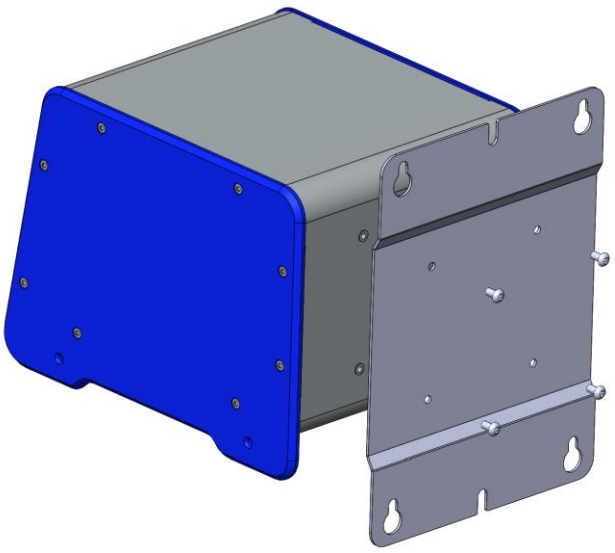
INSTALLATION

Installation of KDU-1A unit

The K-DUCER is supplied with the following mounting bracket (all dimensions reported in mm):



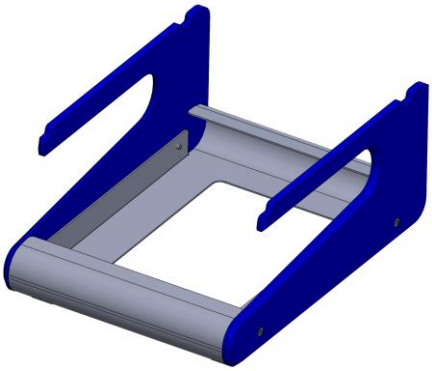


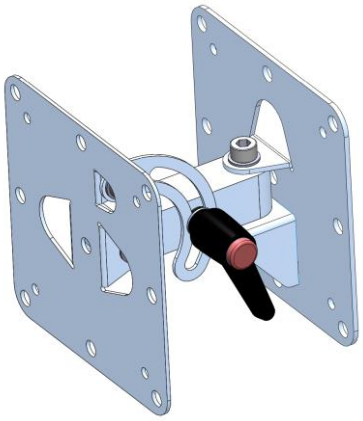


The bracket should be fixed to the four provided 8mm depth female threads on the back panel using the provided M4x8 screws.

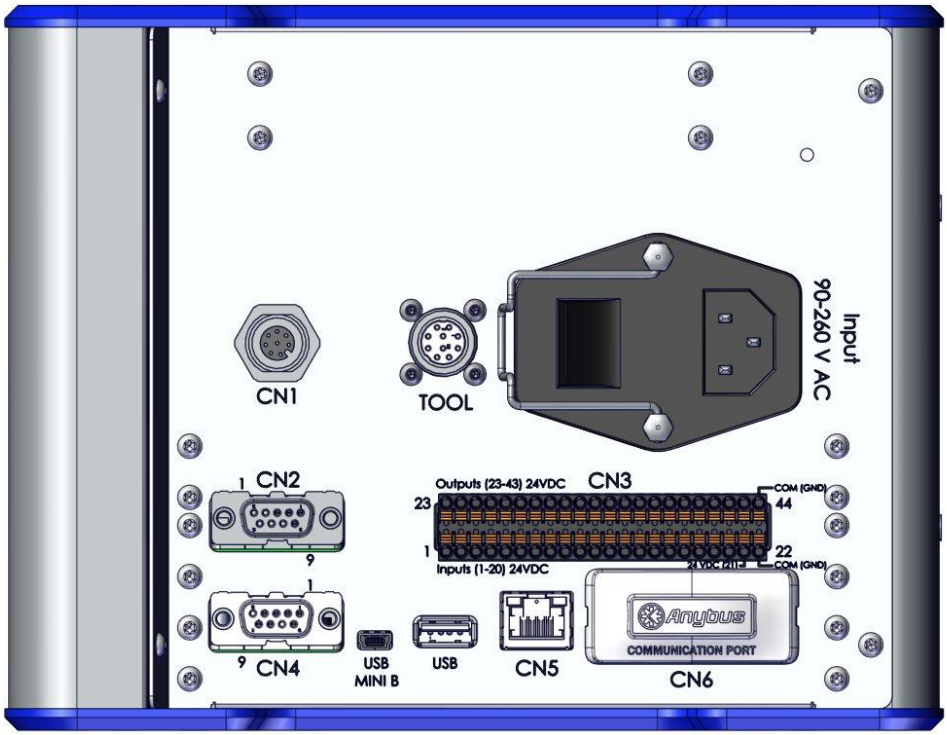
Also available separately:

- table stand (part number 010400)
- vertically and horizontally adjustable bracket (part number 010401).





Connectors



TOOL connector
To connect a KDS series screwdriver. Take care to respect the alignment tabs on the connector. See “Installation of KDS screwdriver” section for instructions on connecting the screwdriver.

CN1 connector
Reserved for servicing the unit and upgrading the firmware.

CN2 male serial connector
To connect with a compatible barcode scanner, such as Kolver Barcode P/N 020050, serial printers such as Kolver PRNTR1, or serial terminals (PC/PLCs).

CN4 female serial connector
To connect with Kolver accessories SWBX88/CBX880, serial printers such as Kolver PRNTR1, or serial terminals (PC/PLCs).

CN3 I/O connector
To connect with 24V I/O functionality such as PLCs, pedals/buttons, LEDS, etc. Refer to REMOTE CONTROL INTERFACES chapter.

CN5 ethernet connector RJ45
To connect using MODBUS TCP, Open Protocol, or K-Expand on any compatible device or software (PLCs, PCs, etc). Refer to REMOTE CONTROL INTERFACES chapter.

USB mini B
To connect using K-Expand software. Refer to K-EXPAND software chapter.

USB A
Plug in a FAT32 formatted flash drive to automatically save screwdriving results and backup all settings. Refer to the “Retrieving and storing the screwdriving results” and “USB menu” sections.

Installation of KDS screwdriver

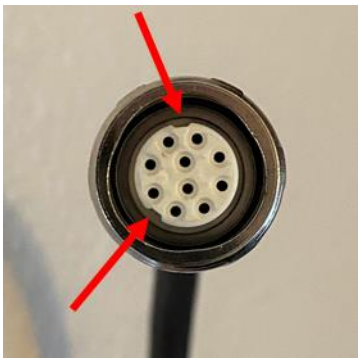
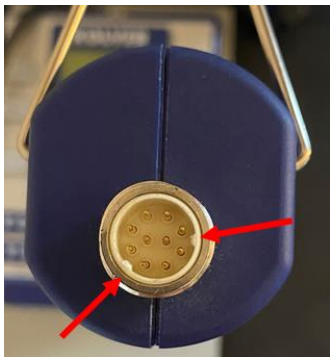
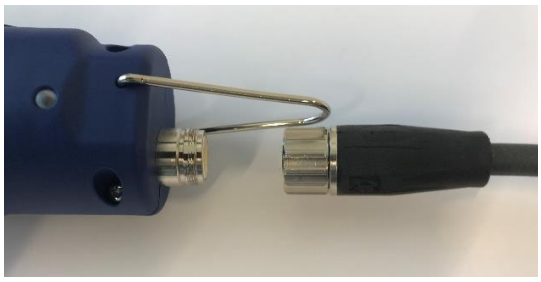
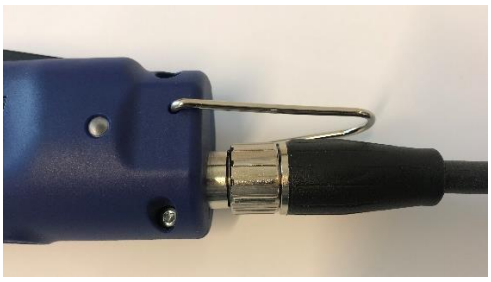
Cable connection and part numbers

The KDS screwdriver series require one of the following cables:

- 2.5m male/female cable (code 250064)
- 2.5m male/female cable with strain relief (code 250064/H)
- 5.0m male/female cable (code 250564)
- 5.0m male/female cable with strain relief (code 250564/H)

To connect the screwdriver to the unit:

1. insert the male connector into the appropriate TOOL connector on the bottom of the unit, taking care to respect the alignment tabs. Push the connector into its position and turn the OPEN/CLOSE nut clockwise until it clicks*
2. insert the female connector into the appropriate connector at the top of the screwdriver, taking care to respect the alignment tabs. Push the connector into its position and turn the OPEN/CLOSE nut clockwise until it clicks*

To disconnect the cable:

1. push the connector in lightly towards the screwdriver or the unit
2. turn the OPEN/CLOSE nut counterclockwise*
3. pull the connector out

*note: some models use a threaded nut instead of an OPEN/CLOSE nut. In this case, tighten the nut all the way until it stops, without overtightening with excessive force.

Installation of reaction arm

Note: a reaction arm is ALWAYS required for KDS screwdrivers size 20Nm and above. Kolver recommends always using a reaction arm for operator comfort, especially for applications with torques above 5 Nm.
Fix the reaction arm to the indicated areas only.

KDS series screwdrivers sizes 15Nm and below have two positions designed for connecting to the reaction arm:

1. The naked metal cylinder near the head of the screwdriver
2. The reinforced plastic section at the very top of the screwdriver (not present on the pistol-shaped version)

KDS series screwdrivers sizes 20Nm and above have only one position designed for connecting to the reaction arm:

1. The naked metal cylinder near the head of the screwdriver

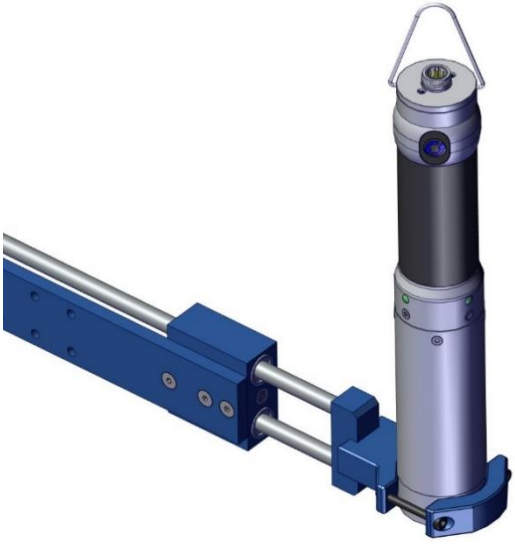
KDS series screwdrivers sizes 20Nm and above also provide four threaded M4 holes for fixing to a custom assembly.

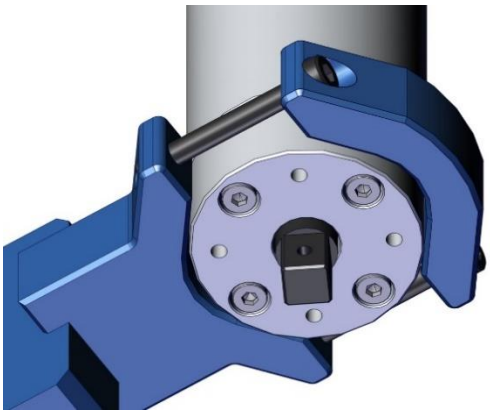
Warning: do not connect the reaction arm anywhere other than the above designated areas. Fixing the reaction arm to the middle of the screwdriver handle will squeeze the screwdriver shell, causing damage to the internal components, and failing to absorb the torque reaction safely and reliably.

Reaction arm connection for KDS series screwdrivers 15Nm and below:

CA automation versions:

Reaction arm connection for KDS series screwdrivers 20Nm and above:

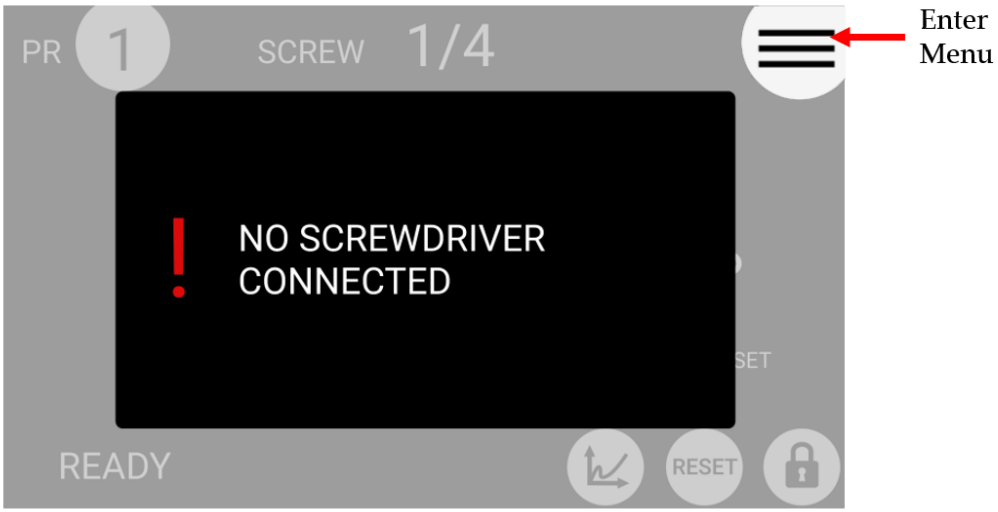


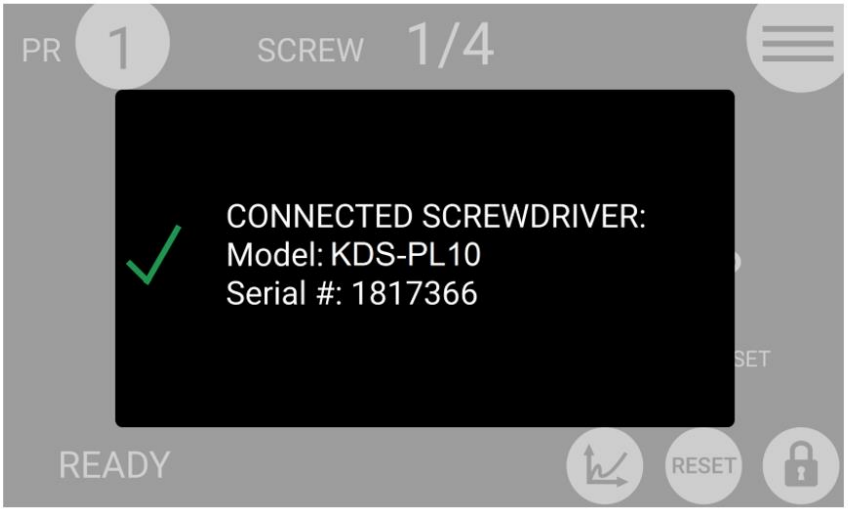


CA automation versions:

QUICK START

Turn the unit on through the on/off switch on the lower panel. The unit will carry a general system check and the words “NO SCREWDRIVER CONNECTED” will appear if no screwdriver is connected.
You can still enter the main menu without any screwdriver connected.
When a screwdriver is connected, it will be recognized by the unit and the "CONNECTED SCREWDRIVER" screen will appear for a few seconds, also showing the model and serial number.
All information pertaining to the connected screwdriver can also be retrieved in the General Settings menu.





If the parameters set in the current program are outside the allowable range of the connected screwdriver, the following screen will appear:

To resolve the error, select a program previously configured for the connected screwdriver model, or enter the main menu to modify the parameter out of range for the current program.

The "Program parameter error" messages can be the following:

TorqueTargOverMax	Target torque higher than the allowed limit for the screwdriver.
SpeedTargOverMax	Target speed higher than the limit allowed for the screwdriver.
SpeedTargUnderMin	Target speed less than the limit allowed for the screwdriver.
DownshiftTorqueOverTarg	The fast phase torque setting is higher than the final target torque.
DownshiftSpeedOverMax	The speed of the slow phase of this program is higher than the maximum allowed by the screwdriver.
DownshiftSpeedUnderMin	The speed of the slow phase of this program is less than the minimum allowed by the screwdriver.
TorqueMaxOverMaxLim	In angle control: the maximum torque set in the program is above the limit of the screwdriver. In torque control: the maximum torque set in the program is higher than 20Nm.
TorqueMaxUnderMinLim	In angle control: the maximum torque set in the program is equal or lower than the minimum limit of the screwdriver. In torque control: The maximum torque set in the program is equal or lower than the target torque already set.

TorqueMinOverMaxLim	In angle control: the minimum torque set in the program is equal or higher than the maximum torque already set. In torque control: the minimum torque set in the program is equal or higher than the target torque already set.
RevTorqueOverMax	The reverse torque of this program is higher than the maximum torque of the screwdriver.
RevSpeedOverMax	The reverse speed is higher than the maximum allowed by the screwdriver.
RevSpeedUnderMin	The reverse speed is lower than the minimum allowed by the screwdriver.

If the connection with the screwdriver is successful, the main screen will be displayed and the screwdriver will be ready for work.

Connect a thumb drive on the USB-A port (the larger USB port) to automatically save all screwdriving results on a text file.

TERMINOLOGY

KDU/K-DUCER/control unit: the KDU1 / KDU1A control unit

KDS/screwdriver: the transducerized screwdriving tool to be used with the KDU control unit

Transducer: electronic component installed inside the KDS screwdriver which measures the torque in real time

Rundown/tightening: the screwdriving cycle, from start (pressing of the lever or initiating remote lever control), to finish (automatic motor stop or lever or remote lever control release, whichever happens first)

Torque: rotational force

Closing torque: the last torque value measured when the screwdriver motor stopped or when the screwdriver lever or remote lever control was released

Target torque: the closing torque that the screwdriver system will apply in the rundown (torque control mode only), resulting in a "Screw OK" result if successful

Prevailing torque: an optional phase of the rundown during which the applied torque is allowed to exceed the target/closing torque

Torque control mode: a rundown where the screwdriver motor automatically stops upon reaching the target torque

Angle: the revolutions of the tip of the screwdriver, in degrees. The start time of the angle measurement depends on the settings chosen.

Target angle: the angle measurement upon which the screwdriver motor will stop (angle control mode only), resulting in an "Angle OK" result if successful

Angle control mode: a rundown where the screwdriver motor automatically stops upon reaching the target angle

Run time: the duration of the rundown, in seconds

Run time mode: a rundown where the screwdriver motor automatically stops at the desired run time

Program/batch: a set of one or more screws sharing the same parameters (torque, angle, speed, barcode, etc)

Program number: the identifier of one of the 64 configurable programs (1 to 64)

Current program: the program currently selected for rundowns

Program mode: in this mode, the unit works according the selected program

Sequence/Job: an ordered set of up to 16 programs, with the option to define how to transition between programs

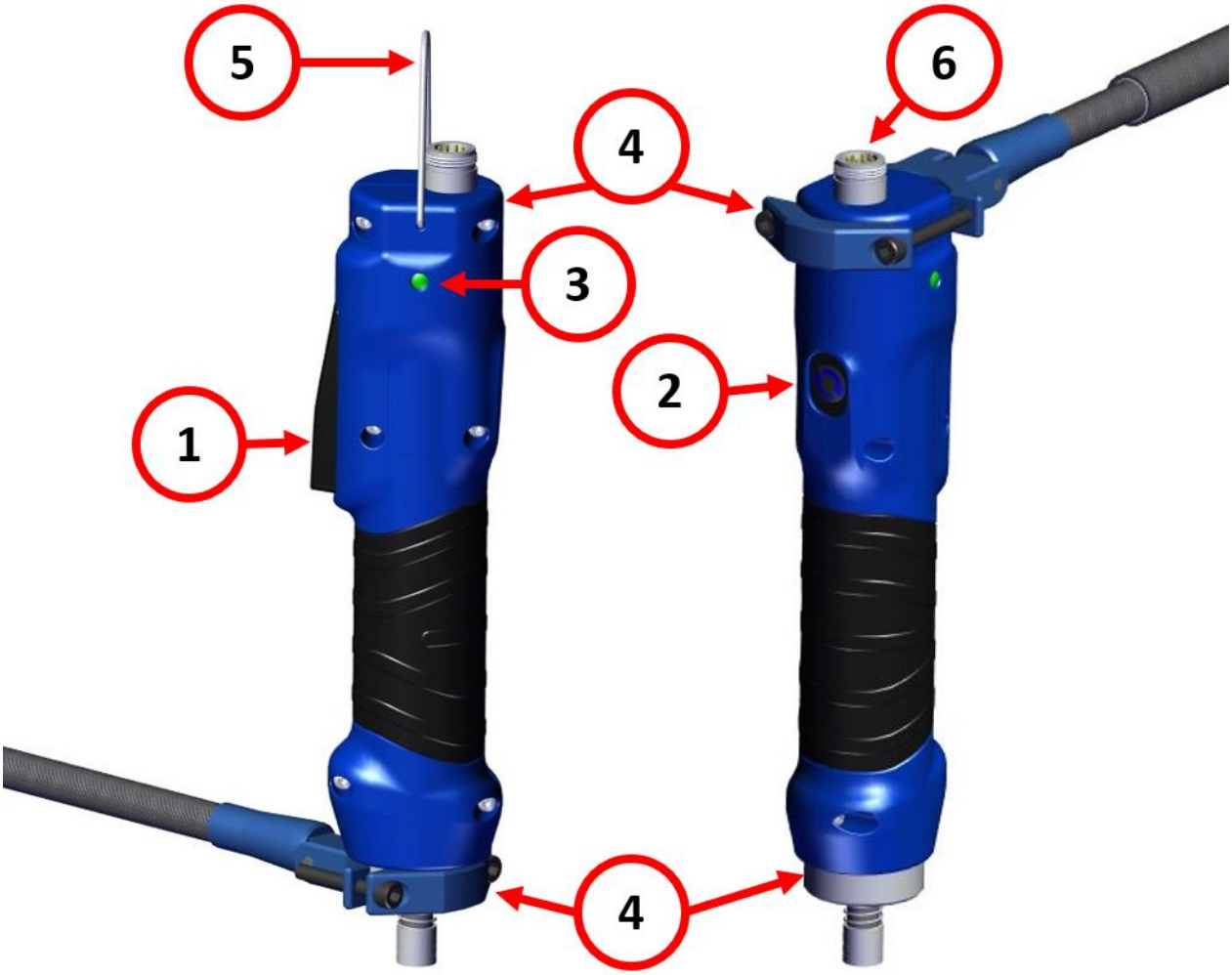
Sequence letter/number: the identifier of one of the 8 configurable sequences (A to H)

Current sequence: the sequence currently selected for rundowns

Sequence mode: in this mode, the unit works according to the selected sequence

OK/NOK: the result of the rundown. OK: rundown finished respecting all of the configured parameters. NOK: rundown finished without respecting one or more of the configured parameters.

OPERATING THE KDS SCREWDRIVER



(1) Lever

Press and hold the lever to initiate a rundown.

Warning: Kolver strongly recommends using a reaction arms when applying torques greater than 5 Nm. A reaction arm with higher Nm capacity is required for KDS screwdriver sizes 20Nm and above. Using KDS screwdrivers sizes 20Nm and above without a reaction arm or with an improperly sized reaction arm may result in severe injury or death.

The screwdriver will automatically stop according to the configured program, in either an OK or a NOK state, depending on the success of the rundown.

The screwdriver will also stop if the lever is released in the middle of the rundown, and either return to the READY state or raise the NOK state if the LEVER ERROR option is active for the current program (Programs menu > Other > LEVER ERROR).

Note: KDS series screwdrivers sizes 20Nm and above provide a “START” button instead of a lever. The functionality remains the same.

(2) Reverse button

Press and hold the button to initiate a defix run, rotating in the opposite direction of the selected direction of rotation for the lever (see Programs menu > Other > ROTATION).
The behavior of the reverse button can be changed from the general settings menu (General Settings > REVERSE BUTTON).

(3) LEDs

The two LEDs indicate the state of the screwdriver:

●	Blinking white: the screwdriver was just connected to the K-DUCER control unit
●	Off: the screwdriver is ready, or the screwdriver is not connected
●	Solid green: the last screw result was OK
●	Solid red: the last screw result was NOK
●	Solid blue: screwdriver is running in the tightening direction, either via the lever or via remote control
●	Solid purple: the screwdriver is running in the de-fix direction, either via the reverse button, or via remote control
●	Blinking purple: the reverse button is in switch mode and is activated. The screwdriver is ready to run in de-fix rotation via the main lever.

(4) Reaction arm connections

Fix the reaction arm to one these areas only, and never anywhere else on the screwdriver.
Note: KDS series screwdrivers sizes 20Nm and above only provide the lower reaction arm connection area.

(5) Hanging hook

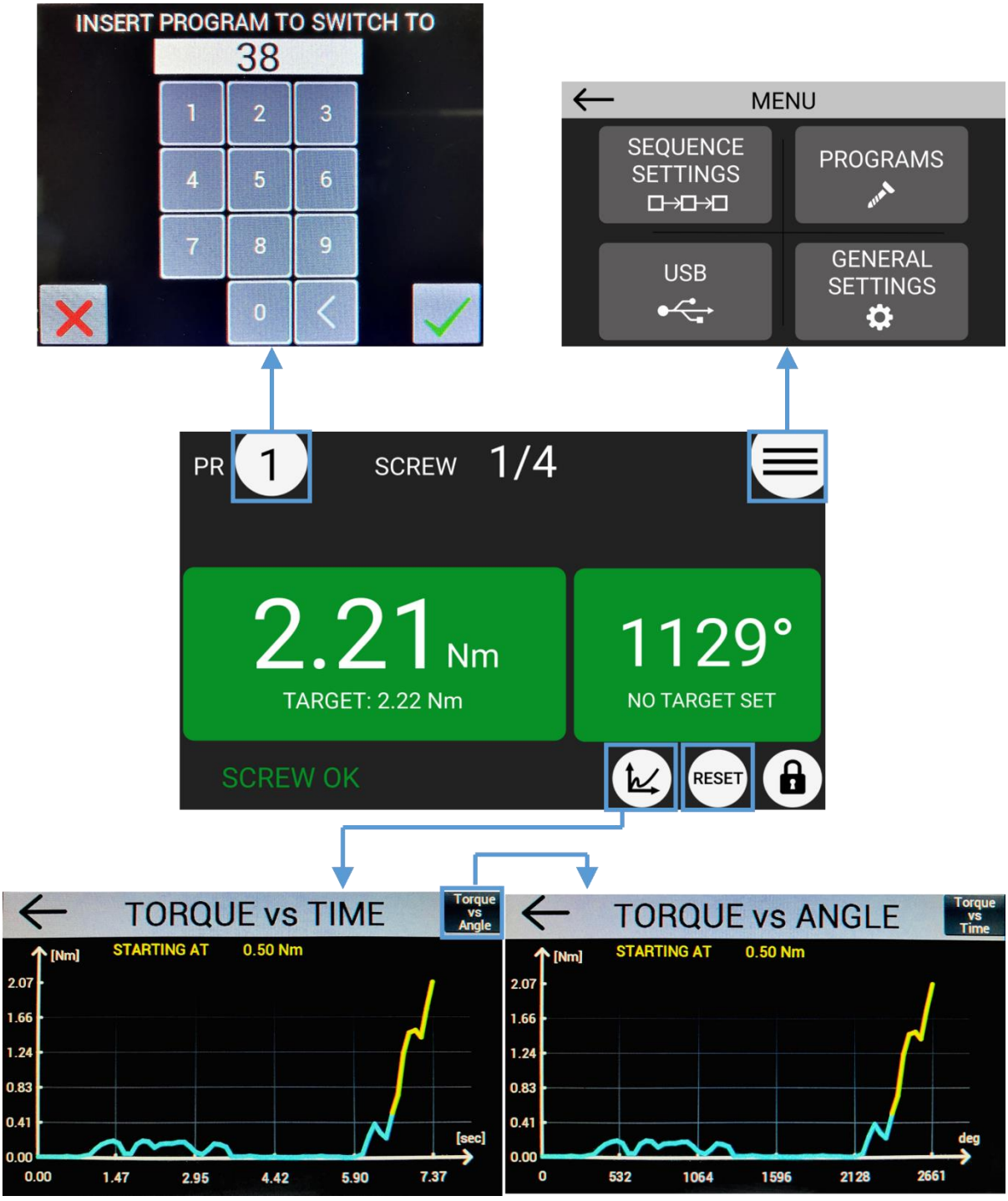
To hang the screwdriver somewhere easily accessible in the operator's workbench.

(6) Female connector

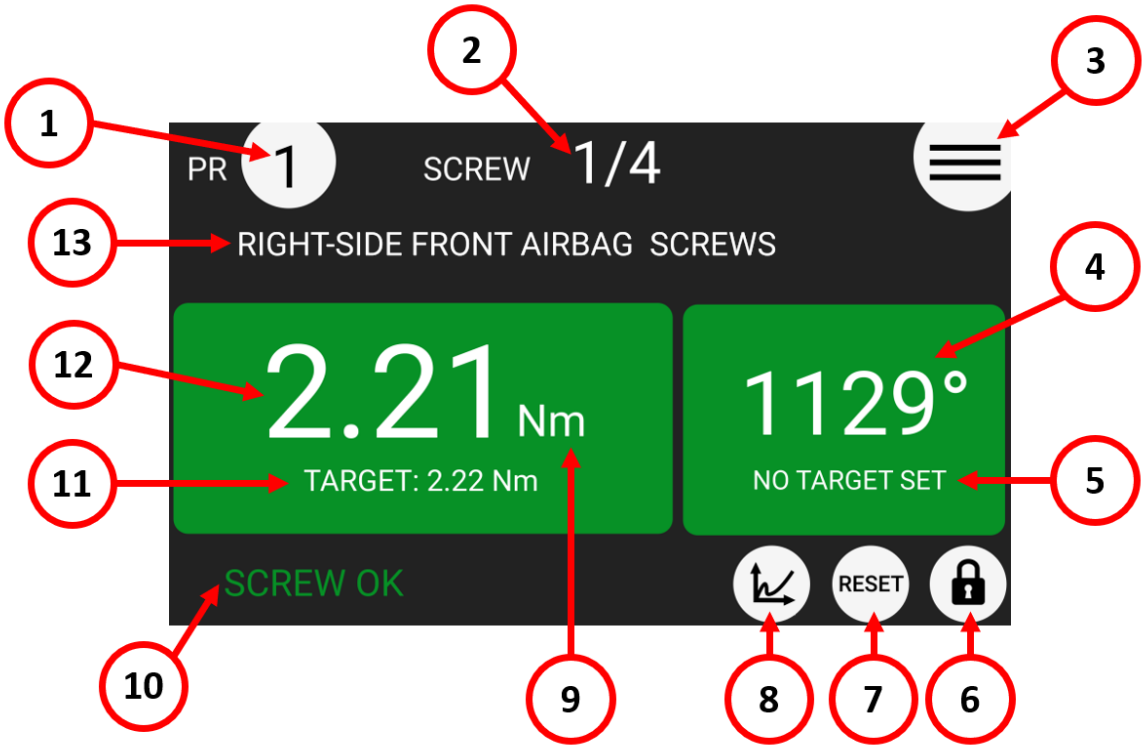
To connect the screwdriver to the K-DUCER control unit

OPERATING THE K-DUCER CONTROL UNIT

Main Screen – Program Mode – navigation tree



Main Screen – Program Mode



(1) Program ("PR") number currently selected

Touch to select a different program (1 through 64).

(2) Screw count

Counter: screws successfully completed / number of screws in current program

Note: does not appear if NUMBER OF SCREWS parameter is set to zero. Number of screws is also referred to as "batch size" in the industry.

(3) Main Menu Button (≡)

Tap to enter the main menu

(4) Angle value

Measured angle value for last screw, in degrees.

(5) Angle target

Shows the target angle when in angle control mode, or the min/max angle bounds when in torque control mode or timed rundown mode, for the current program, in degrees.

(6) Menu lock status

White background means no password is required to access the configuration menu.

Red background means the configuration menu is password protected.

(7) Reset ("RST") button

Screw/Program/Sequence Reset ("RST") button. Presence and function of this button depend on the corresponding settings in the GENERAL SETTINGS menu.

(8) Torque charts

Tap to display the Torque-time and torque-angle charts for last screw. In firmware v35 and newer only: the graphs will also highlight the portion of the torque after the angle STARTING AT value.

(9) Torque measurement unit

You can select a different unit from the GENERAL SETTINGS menu.

(10) Status bar

Shows the last screw result or error messages (ready, screw OK, screw NOK, errors).

(11) Torque target

Shows the target torque when in torque control mode, or the min/max torque bounds when in angle control mode or timed rundown mode, for the current program.

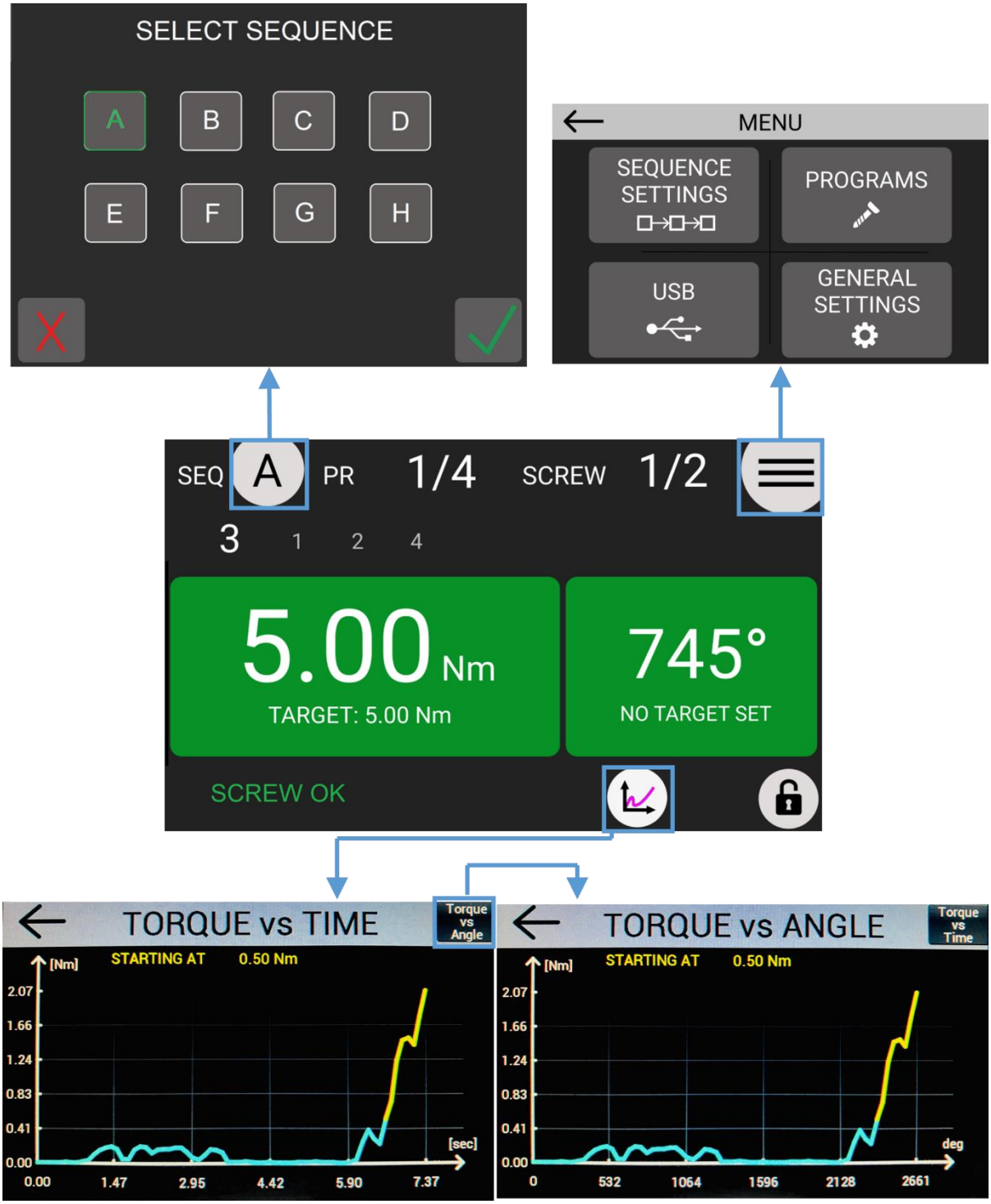
(12) Torque value

Measured torque value applied to the last screw.

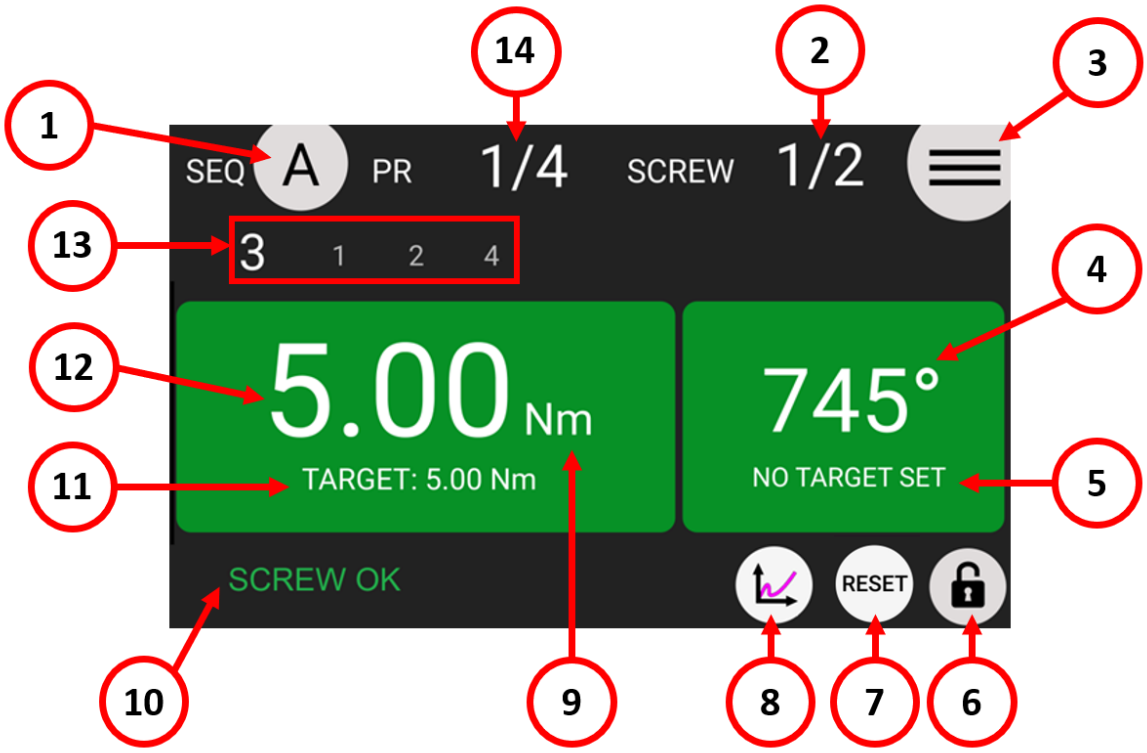
(13) Program description

Shows the description for the current program. You can enter a description for the current program via Programs Menu > Other > DESCRIPTION.

Main Screen – Sequence Mode – navigation tree



Main Screen – Sequence Mode



(1) Sequence ("SEQ") currently selected

Touch to select a different sequence (A through H).

(2) Screw count

Counter: screws successfully completed / number of screws in current program

Note: does not appear if NUMBER OF SCREWS parameter is set to zero. Number of screws is also referred to as "batch size" in the industry.

(3) Main Menu Button (≡)

Tap to enter the main menu

(4) Angle value

Measured angle value for last screw, in degrees.

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Shows the target angle when in angle control mode, or the min/max angle bounds when in torque control mode or timed rundown mode, for the current program, in degrees.

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(9) Torque measurement unit

You can select a different unit from the GENERAL SETTINGS menu.

(10) Status bar

Shows the last screw result or error messages (ready, screw OK, screw NOK, errors).

(11) Torque target

Shows the target torque when in torque control mode, or the min/max torque bounds when in angle control mode or timed rundown mode, for the current program.

(12) Torque value

Measured torque value applied to the last screw.

(13) Current and next program numbers in sequence

Shows the current program loaded in the sequence in larger font, and the following program numbers in the sequence.

(14) Program count

Counter: programs successfully completed / number of programs in current sequence

Retrieving and storing the screwdriving results

There are several ways to store and retrieve the results of each rundown.

Via MODBUS TCP or Open Protocol (CN5)

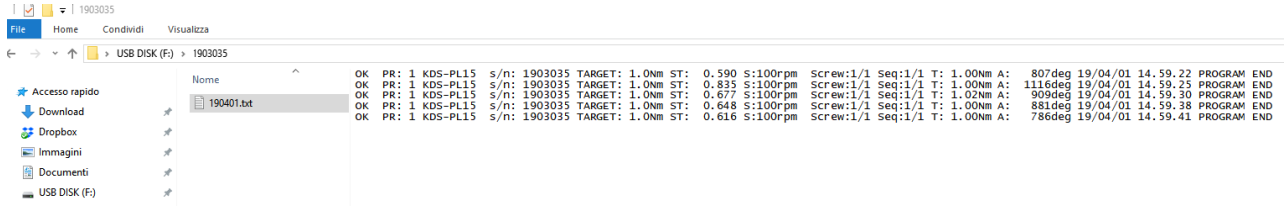
Refer to the MODBUS TCP section. Kolver also provides a ready-to-use python script to retrieve and save the screwdriving results that can be run on a PC computer/server, included in the MODBUS TCP code examples and literature packet.

Via K-Expand software (mini-USB or CN5)

Refer to the K-EXPAND software section.

On USB flash drive (USB-A)

Simply connect a FAT32-formatted USB drive on the USB-A connector.
The K-DUCER will create a folder named as the serial number of the connected screwdriver. Inside this folder, the K-DUCER will save the results of each rundown inside a text file. The name of the text file will be the date of the first rundown contained.



Via serial printer or serial terminal (CN2 or CN4)

You can connect to CN2/CN4 with a serial printer (for example Kolver model PRNTR1) or with any serial terminals, for example Hyper Terminal, Realterm, or K-Expand for PC, to print the results of each rundown.
The print string is automatically transmitted at the end of each rundown.

The serial connection parameters must be:
RS232 – 9600 baud – 8 data bits – 1 stop bit – no parity

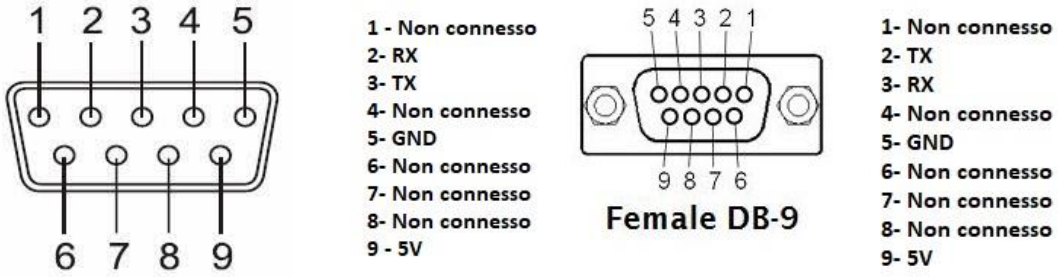
The print string contains the following data:

Section	Description	Example
Barcode	Printout of the scanned barcode	BC: 7612320103052
Result	OK or NOK depending if rundown completed respecting the configured parameters or not	OK
Program	The program number used for the rundown	PR: 8

Model	The screwdriver model used for the rundown	KDS-PL10
Serial Nr	The serial number of the screwdriver	s/n: 1814914
Target	The target torque or angle	TARGET: 2.0Nm
Screw Time	The duration of the rundown in seconds	ST: 1.23
Speed	The closing speed of the rundown	S: 600rpm
Screw count	Number of *successfully* tightened screws / total number of screws in program	Screw: 1/8
Sequence	Current sequence and program within sequence (program is positional: current/total)	Seq: 1/3
Torque	Final torque of the rundown	T: 1.99Nm
Angle	Final angle of the rundown	A: 114deg
Date-time	Date time of the rundown	18/01/18 17.44.50
Notes or Errors	Notes such as "PROGRAM END" for OK results, or error details such as "Err Angle Max" for NOK results	PROGRAM END, *or* Err Angle Max

For example:

```
BC: 7612320103052 OK PR: 8 KDS-PL10 s/n: 1814914 TARGET: 2.0Nm ST:
1.23 S:600rpm Screw:1/8 Seq: A 1/1 T: 1.99Nm A: 114deg 18/01/18
17.44.50
NOK PR:26 KDS-MT1.5 s/n: 1964211 TARGET:10.00lbf.in ST: 10.166
S:300rpm Screw:0/7 Seq:1/1 T: 0.00lbf.in A: 20008deg 20/02/30
11.33.10 Err Angle Max
```



PIN	NAME	FUNCTION
2	RX	RS232 reception.
3	TX	RS232 transmission.
5	GND	Common to every input. Signals have to be enabled making contact between the desired signal and this pin (GND).
9	+5V	Not used

Connecting a barcode scanner

The K-DUCER is compatible with RS-232 capable barcode scanners such as Kolver P/N 020050 (1D barcode scanner) and 020051 (2D barcode scanner).
Any barcode type supported by the scanner will work with the K-DUCER, but the total length of each barcode must be 15 characters or less.

Connect the barcode scanner to the CN2 9-pin male serial connector. If using a 2D barcode scanner such as Kolver P/N 020051, you must also connect the external power supply included with the scanner.

The barcode scanner should be configured with the following serial connection parameters:

RS232 – 9600 baud – 8 data bits – 1 stop bit – no parity

For Kolver P/N 020051, this is done by scanning a configuration barcode included with the accessory. For other scanners, refer to their user manual.

Note: CR+LF termination characters must also be configured in the barcode scanner when using K-DUCER motherboard firmware versions v34 and prior.

Once connected, select one of the five barcode modes to work with: see BARCODE MODE.

Connecting Kolver accessories SWBX88, CBS880

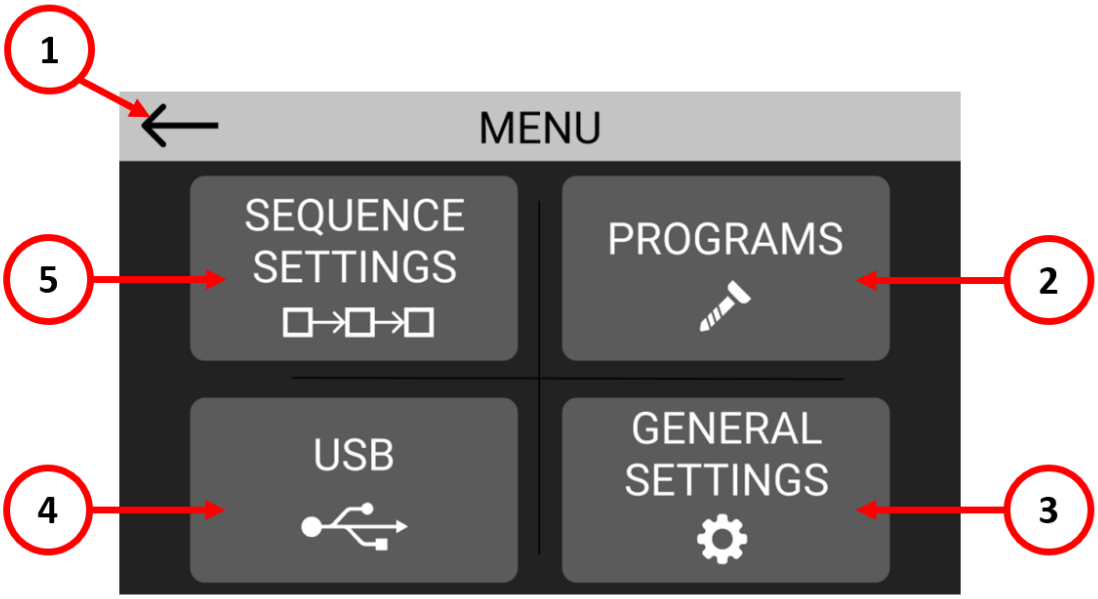
To utilize the accessories SWBX88 (switchbox) and CBS880 (socket tray) you'll need the M-F serial cable (code 881007) and the KIT KDU ADAPTER WITH SW AND CBS (code 010410). Connect and secure the adapter to the accessory, then the M-F cable from the adapter to the CN4 connector on the K-DUCER:

To use the accessories, first select the “On Prog” option from General Settings > SWBX88/CBS880.
Then, enter the desired SWBX88/CBS880 position in Programs > Other > SWBX88/CBS880 to associate the accessory position with one of the program numbers 1-64.
The K-DUCER will now match the program number to the corresponding accessory bit or button positions 1 to 8.

To use the accessories for sequence selection instead of program selection, first activate SEQUENCE toggle, then select “On Seq” instead of “On Prog” in the general settings menu field SWBX88/CBS880.
The K-DUCER will now match sequences A through H to the accessory bit or button positions 1 to 8.

CONFIGURING THE K-DUCER
MAIN MENU

From the main screen, enter the main menu by tapping on the ☰ button on the top right.



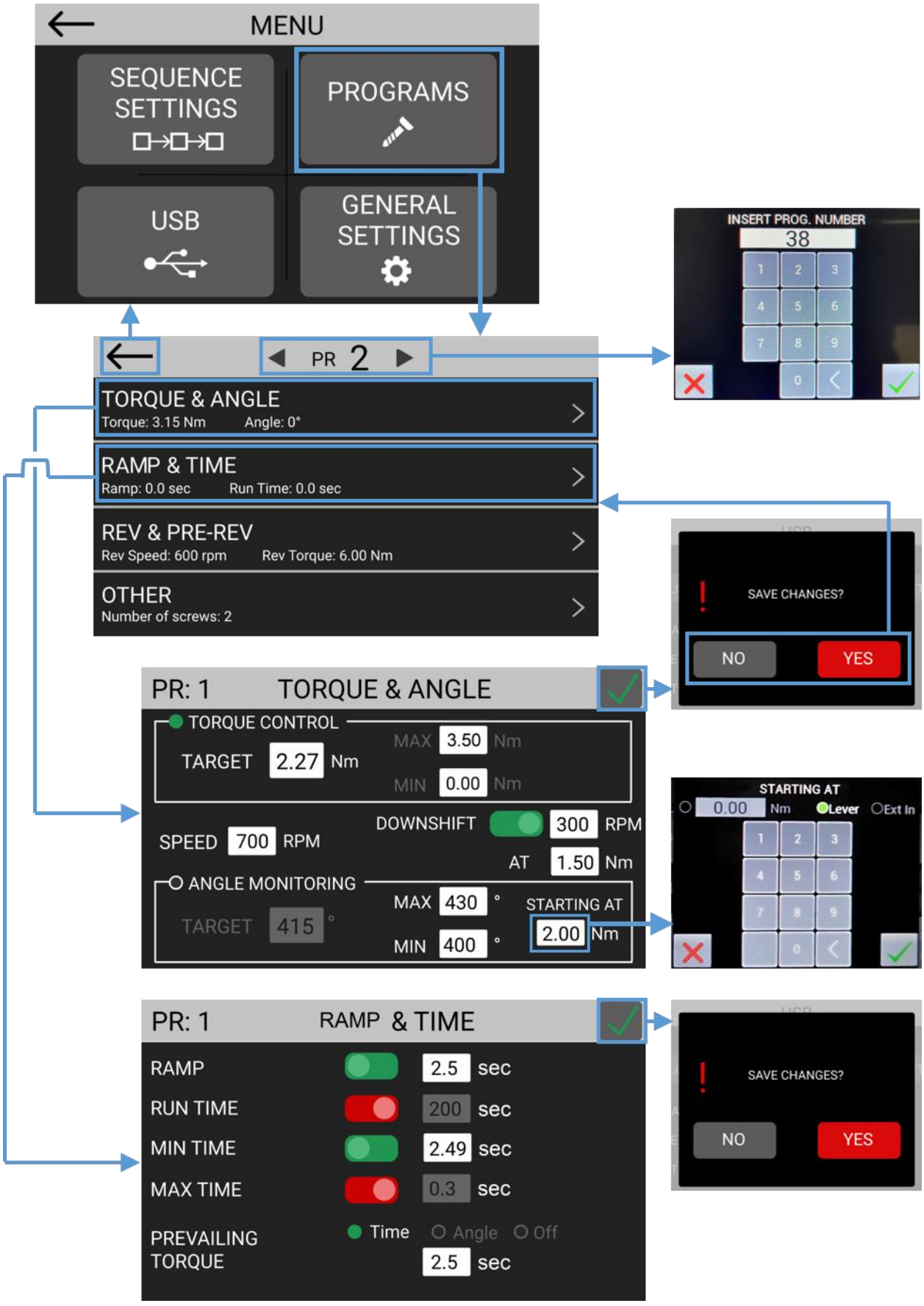
(1) Touch to return to the main screen.
(2) Touch to enter the program configuration menu, to configure parameters such as torque, angle, runtime, for each program. You can configure up to 64 different programs.
(3) Touch to enter the general settings menu, to configure general parameters such as passcode lock, I/O and MODBUS settings, kolver accessories, language, etc.
(4) Touch to enter the USB menu to save or load settings from a USB drive. Note: if a USB drive is connected, the unit automatically saves all screwdriving results in a text file.
(5) Touch to enter the sequence configuration menu, to configure a sequence of up to 16 different programs and the type of transition between each program.

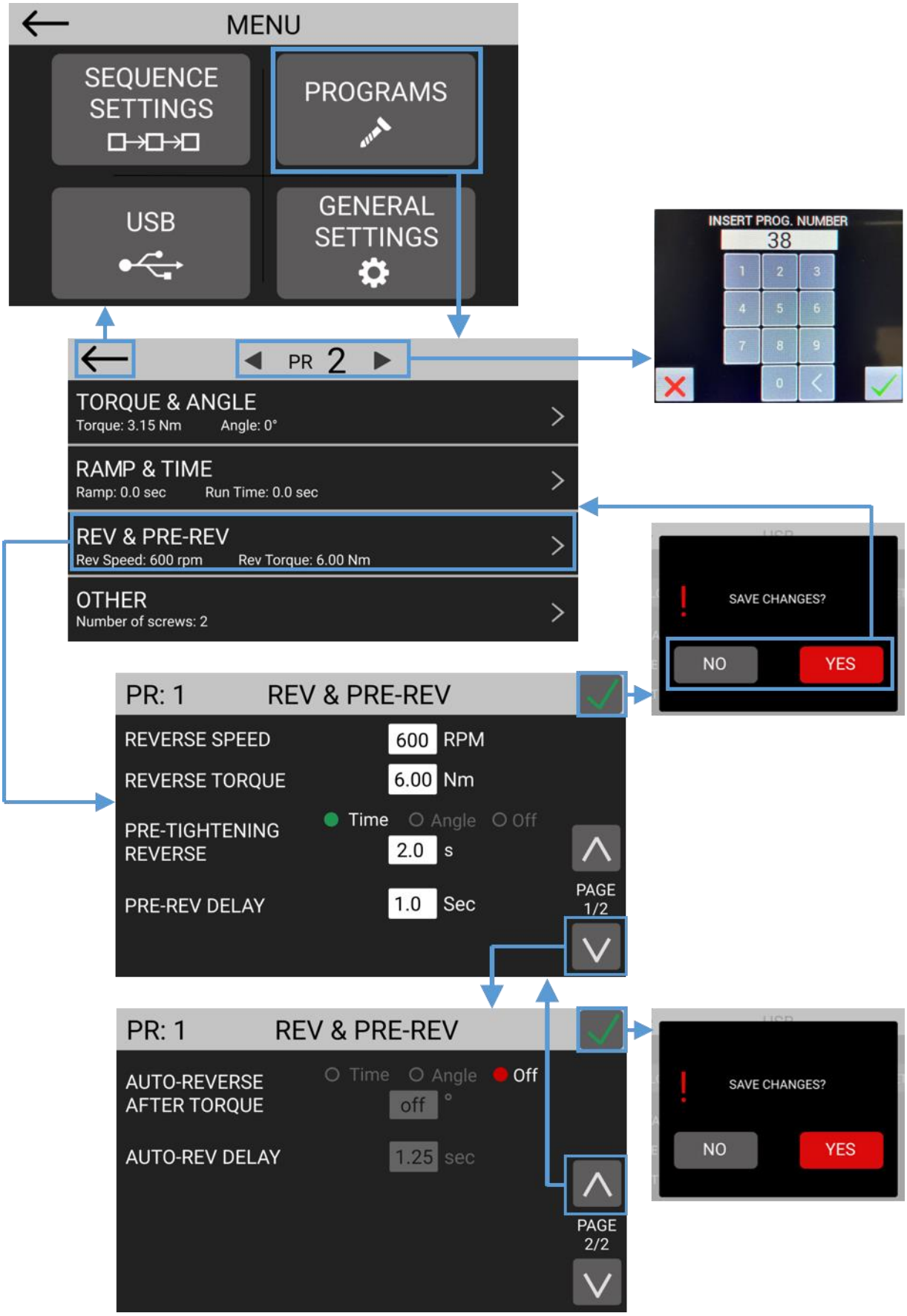
PROGRAMS menu

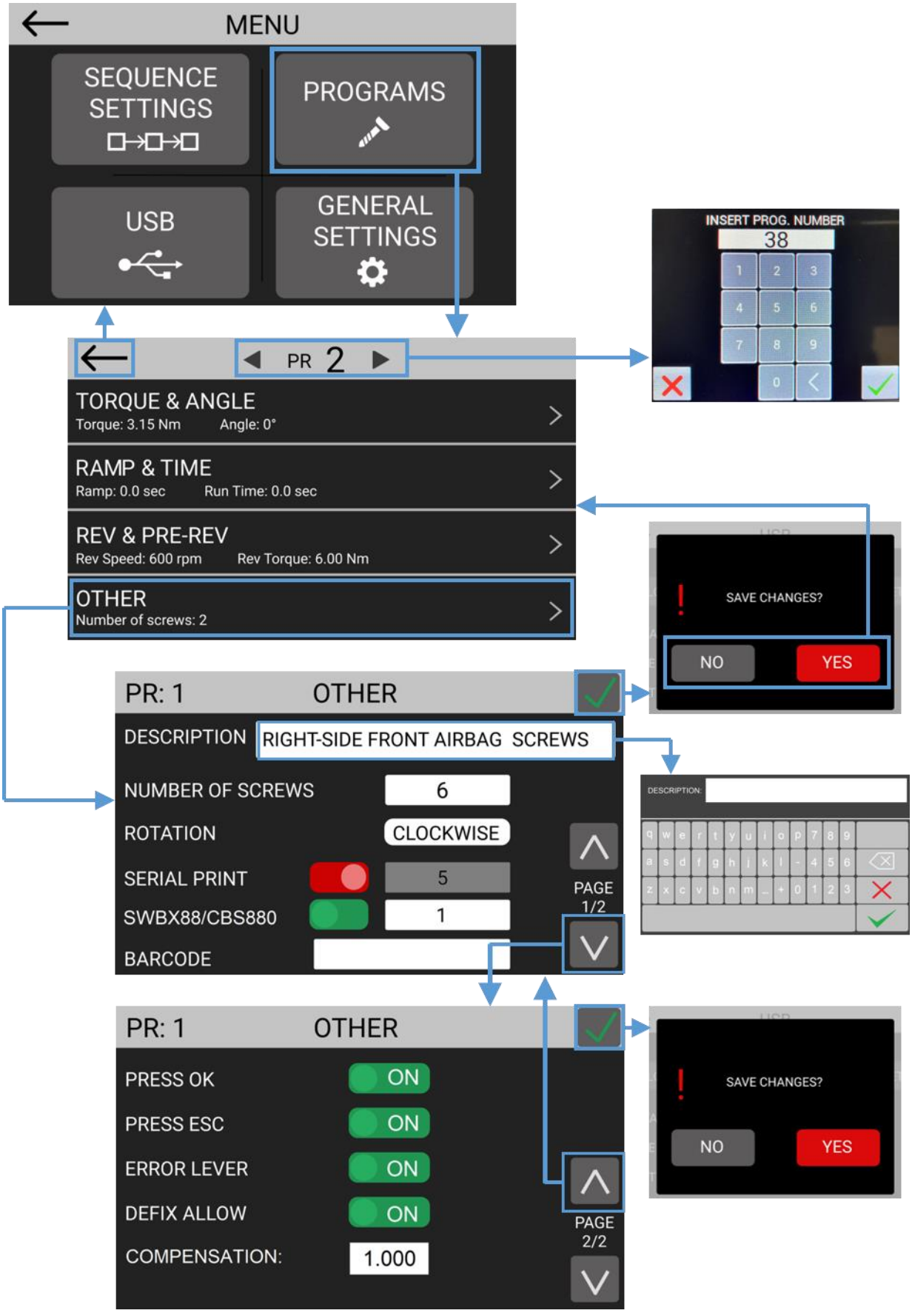
Programs represent batches of one or more screws sharing the same parameters (torque, angle, speed, etc). With the K-DUCER series, you can define up to 64 different programs as well as assign a barcode to each for automatic selection with a barcode scanner.

Tap the Programs button from the main menu to enter the programs menu.
Select one of 64 programs to edit by tapping on the program number or the arrows on the top bar.
Enter one of the four sub-menus to modify the desired parameters for the program selected.

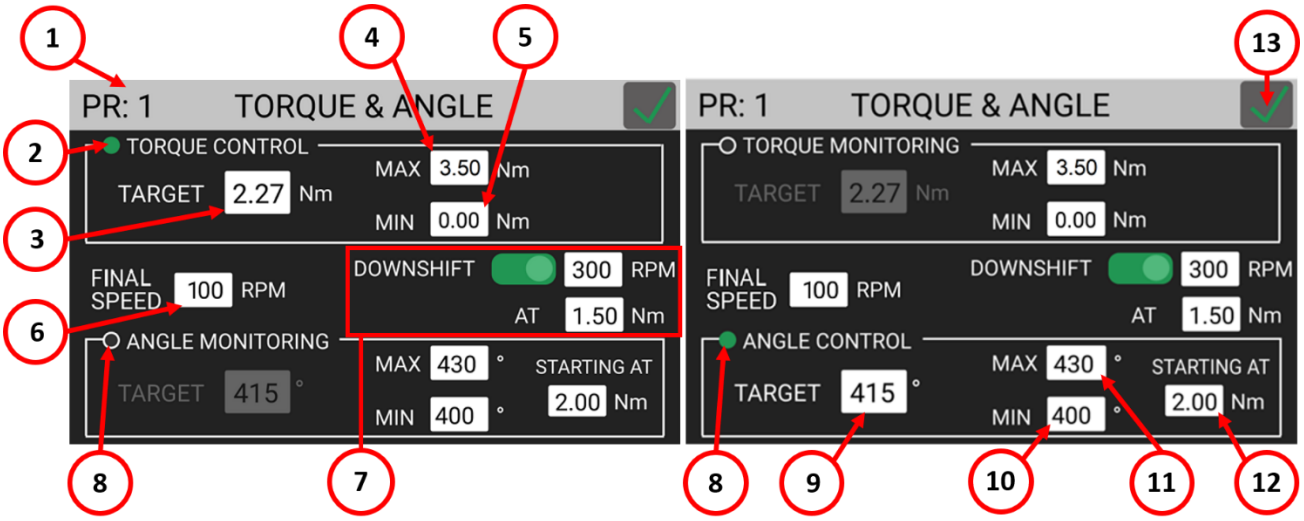
PROGRAMS menu tree




MENU
SEQUENCE SETTINGS
PROGRAMS
USB
GENERAL SETTINGS
INSERT PROG. NUMBER
38
PR 2
TORQUE & ANGLE
Torque: 3.15 Nm
Angle: 0°
RAMP & TIME
Ramp: 0.0 sec
Run Time: 0.0 sec
REV & PRE-REV
Rev Speed: 600 rpm
Rev Torque: 6.00 Nm
OTHER
Number of screws: 2
SAVE CHANGES?
NO
YES
PR: 1
REV & PRE-REV
REVERSE SPEED
600
RPM
REVERSE TORQUE
6.00
Nm
PRE-TIGHTENING REVERSE
Time
Angle
Off
2.0
s
PRE-REV DELAY
1.0
Sec
PAGE 1/2
PR: 1
REV & PRE-REV
AUTO-REVERSE AFTER TORQUE
Time
Angle
Off
off
°
AUTO-REV DELAY
1.25
sec
PAGE 2/2
SAVE CHANGES?
NO
YES


MENU
SEQUENCE SETTINGS
PROGRAMS
USB
GENERAL SETTINGS
INSERT PROG. NUMBER
38
PR 2
TORQUE & ANGLE
Torque: 3.15 Nm
Angle: 0°
RAMP & TIME
Ramp: 0.0 sec
Run Time: 0.0 sec
REV & PRE-REV
Rev Speed: 600 rpm
Rev Torque: 6.00 Nm
OTHER
Number of screws: 2
SAVE CHANGES?
NO
YES
PR: 1
OTHER
DESCRIPTION
RIGHT-SIDE FRONT AIRBAG SCREWS
NUMBER OF SCREWS
6
ROTATION
CLOCKWISE
SERIAL PRINT
5
SWBX88/CBS880
1
BARCODE
PAGE 1/2
PRESS OK
ON
PRESS ESC
ON
ERROR LEVER
ON
DEFIX ALLOW
ON
COMPENSATION:
1.000
PAGE 2/2

TORQUE & ANGLE menu



(1) Program Number

Indicates the program that is currently being edited. You can select a different program to edit from the previous screen.

(2) TORQUE CONTROL / ANGLE MONITORING flag

Tap to select Torque Control and Angle Monitoring mode.
In this mode, the screw is tightened down to the target torque, and the angle (the number of revolutions of the screw, in degrees) reached at the target torque is measured. The STARTING AT (12) setting controls the starting point for the angle measurement (at torque threshold, at lever pressed, or at external signal received).

(3) TARGET Torque

Tap to set the target torque. Only available in Torque Control/Angle Monitoring mode. For prevailing torque settings, see the Ramp & Time menu.
Note: continuous use at or over 80% of the screwdriver's nominal torque range is not recommended.

(4) MAX Torque

If the torque measured at the end of the rundown exceeds the MAX Torque value, the rundown will be considered unsuccessful (NOK) and a corresponding error will be raised. Applicable to Torque Control as well as Angle Control modes.

(5) MIN Torque

If the torque measured at the end of the rundown is below the MIN Torque value, the rundown will be considered unsuccessful (NOK) and a corresponding error will be raised. Applicable to Torque Control as well as Angle Control modes.

(6) FINAL SPEED

Tap to select the tightening speed of the screwdriver, in RPM.
If the (7) DOWNSHIFT function is used, this will be the final tightening speed that the screwdriver will downshift to after the selected "AT" threshold is reached.
For the reverse speed of the screwdriver, see the REV & PRE-REV. Note that you can invert the tightening and untightening directions of rotation via the PROGRAMS > OTHER menu.

WARNING: carefully choosing the right combination of speed and downshift settings for the application will maximize the precision and lifetime of the tool while minimizing your assembly cycle time.
While the appropriate settings can be highly specific to each application, there exist a few rules of thumb:

A high approach speed minimizes motor strain and assembly cycle time, but can mechanically stress and even break the part or the tool if the joint is hard.

Hard/inelastic joints are best finished at low speed, to improve precision and avoid a high velocity impact at the end of the rundown. Utilize the DOWNSHIFT setting with a very low torque AT threshold (<20% of target torque) and slow FINAL SPEED, to ensure that the last revolutions are executed slowly and in control.

Soft/elastic joints, especially those requiring high target torques relative to the range of the tool, are best executed at high speed, to avoid excess strain on the motor. Utilize the DOWNSHIFT setting with a high torque AT threshold (>80% of target torque), to ensure most of the torque is applied at higher speed.

(7) DOWNSHIFT

The DOWNSHIFT function lets you execute the rundown in two phases: a high speed approach (enter the speed in the "RPM" field), followed by a lower (6) FINAL SPEED after a certain torque threshold is reached.
If OFF (red), the screwdriver will run at the (6) FINAL SPEED for the entire rundown.
If ON (green), the screwdriver will run at the entered "RPM" speed until a certain torque is reached (AT torque value), at which point it will downshift to the (6) FINAL SPEED for the remainder of the rundown.
Note: most applications will benefit from using the DOWNSHIFT setting, as it allows to minimize production cycle times (running the screwdriver fast) without compromising on final torque precision (finishing the rundown at a slow, controlled speed).

(8) ANGLE CONTROL / TORQUE MONITORING flag

Tap to select Angle Control and Torque Monitoring mode.
In this mode, the screw is tightened down to the target angle (number of revolutions of the screw, in degrees), while the torque is measured.

(9) TARGET Angle

Tap to set the target angle. Only available in Angle Control/Torque Monitoring mode.

(10) MIN Angle

If the angle measured at the end of the rundown is below the MIN Angle value, the rundown will be considered unsuccessful (NOK) and a corresponding error will be raised. Applicable to Torque Control as well as Angle Control modes.

(11) MAX Angle

If the angle measured at the end of the rundown exceeds the MAX Angle value, the rundown will be considered unsuccessful (NOK) and a corresponding error will be raised. Applicable to Torque Control as well as Angle Control modes.

(12) STARTING AT

Tap to select the starting point for the angle measurement. Three modes are available:

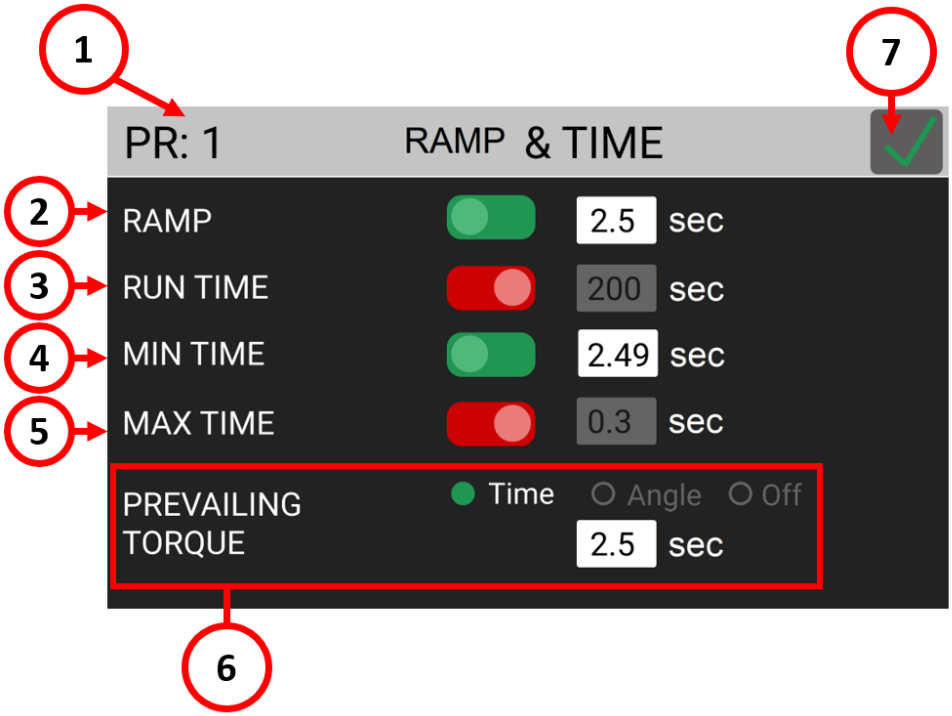
- Torque threshold: the angle measurement starts after the torque reaches this value

- Lever: the angle measurement starts as soon as the screwdriver level is pressed
- Ext In: the angle measurement starts after the IN-ANG external I/O signal is received

(13) Exit/Save key

Tap to return to the previous menu and save or discard any changes made.

RAMP & TIME menu



(1) Program number

Indicates the program that is currently being edited. You can select a different program to edit from the previous screen.

(2) RAMP

The ramp function makes the screwdriver gradually accelerate to the target SPEED
Enter a time between 0.3 and 3 seconds to set the duration of the ramp phase.
If OFF, the screwdriver starts immediately turning at the target SPEED when the lever is pressed (or when the screwdriver starts through remote control).
If ON, the screwdriver speed will ramp up to the target SPEED in the time set.
If you wish to display an error when the screwdriver reaches target torque or angle during the ramp phase, use the (4) MIN TIME function with a timer value equal to the RAMP timer.

(3) RUN TIME

The RUN TIME function makes the screwdriver stop after the set timer, irrespective of the torque or angle reached.
If ON, the screwdriver will stop after the set amount of time or when the torque or angle targets are reached, whichever event happens first. If the run time is reached before the target torque or angle, then the torque and angle reached at the time the screwdriver

stops will be displayed and will be used to determine whether the result was OK or NOK depending on the min/max limits set on torque, angle, and/or time.
If OFF, the screwdriver will turn indefinitely until the target or max limits set on torque, angle, and/or time are reached.

(4) MIN TIME

The MIN TIME function makes the screwing result NOK (error) if the target torque or angle is reached before the set minimum time.
If ON, "Below minimum time" error will be displayed if target torque or angle is reached before the set minimum time, counting from the moment the lever is pressed or a remote start signal is received.
If OFF, this functionality is disabled.

(5) MAX TIME

The MAX TIME function makes the screwing result NOK (error) if the target torque or angle is not reached before the set maximum time.
If ON, "Over maximum time" error will be displayed if target torque or angle is not reached before the set maximum time, counting from the moment the lever is pressed or a remote start signal is received.
If OFF, this functionality is disabled.

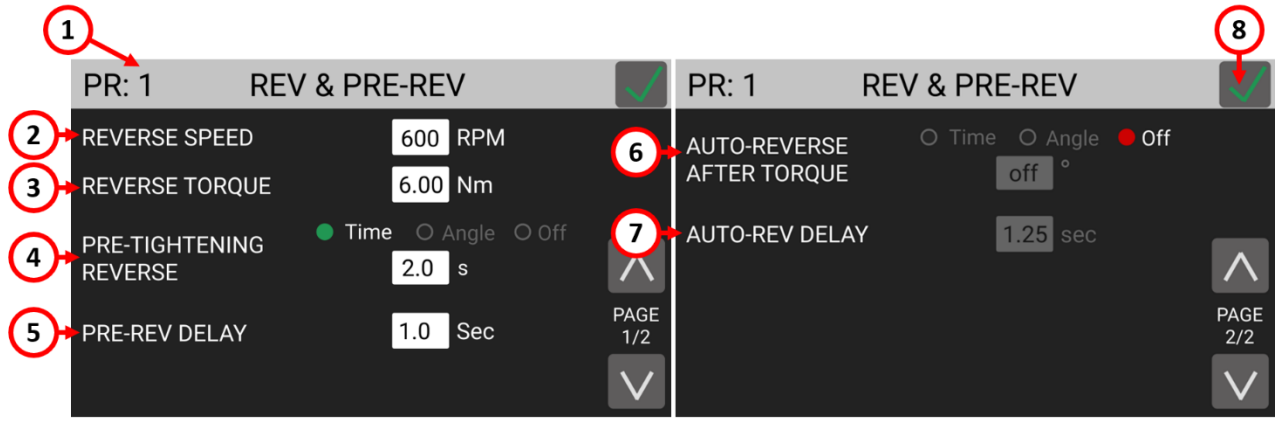
(6) PREVAILING TORQUE

The PREVALING TORQUE function makes the screwdriver work at maximum torque for a set time period or angle selected.
WARNING: This function is useful for applications where the prevailing torque is higher than the final target torque (for example self-tapping screws or locknuts). Please use this function with utmost attention because an incorrect use can damage both the assembly and the screwdriver!
The time or angle are counted from the moment the lever is pressed or a remote start signal is received.
This function can be overlapped with the RAMP function.
The SPEED setting is respected during the prevailing torque phase.
If the torque measured during the prevailing torque time exceeds the maximum torque achievable by the screwdriver, in other words, if the screwdriver stops turning during the prevailing torque phase, "Error pvt time" will be displayed.
If OFF, this functionality is disabled.

(7) Exit/Save Key

Tap to return to the previous menu and save or discard any changes made.

REV & PRE-REV menu



(1) Program number

Indicates the program that is currently being edited. You can select a different program to edit from the previous screen.

(2) REVERSE SPEED

Tap to select the untightening speed of the screwdriver, in RPM.

WARNING: This setting also applies to the PRE-TIGHTENING REVERSE and AUTO-REVERSE AFTER TORQUE functions.

Settings from the TORQUE & ANGLE and RAMP & TIME menu do not apply when untightening.

Note that you can invert the tightening and untightening direction of rotation via PROGRAMS > OTHER > ROTATION.

(3) REVERSE TORQUE

Tap to set the maximum reverse torque that the screwdriver will allow while untightening, within the range of the screwdriver selected.

WARNING: This setting also applies to the PRE-TIGHTENING REVERSE and AUTO-REVERSE AFTER TORQUE functions.

If you're using an open-end wrench attachment, the reverse torque should be set to MIN value in order to bring the wrench back to the correct position.

(4) PRE-TIGHTENING REVERSE

This function makes the screwdriver turn in the reverse direction for a set time duration or angle after the target torque or angle are reached.

The speed and torque utilized in the PRE-TIGHTENING REVERSE phase are set in the REVERSE SPEED and REVERSE TORQUE settings above.

If OFF, this functionality is disabled.

(5) PRE-REV DELAY

The amount of idle time between the end of the PRE-TIGHTENING REVERSE phase and the tightening phase. The lever must remain pressed or the remote start command must remain active during this idle time. Cannot be set to less than 0.3 seconds. Only active if the PRE-TIGHTENING REVERSE function is not OFF.

(6) AUTO-REVERSE AFTER TORQUE

This function makes the screwdriver turn in the reverse direction for a set time duration or angle after successfully completing the tightening phase.

The speed and torque utilized in the PRE-TIGHTENING REVERSE phase are set in the REVERSE SPEED and REVERSE TORQUE settings above.
This function activates only if the screw result from the tightening phase was OK. If there was an error in executing or completing the tightening phase, the screwdriver will not proceed with the AUTO-REVERSE AFTER TORQUE phase.
WARNING: the lever must remain pressed or the remote start command must remain active during the entire AUTO-REVERSE AFTER TORQUE phase, otherwise the screwing result will be NOK and an error will be raised.
If OFF, this functionality is disabled.
Note: if the tightening phase was successful, the OK signal will not be raised until the completion of the AUTO-REVERSE AFTER TORQUE phase. The TORQUE and ANGLE results displayed at the end of the AUTO-REVERSE AFTER TORQUE phase will correspond to the torque/angle results from the tightening phase, and not those from the AUTO-REVERSE AFTER TORQUE phase.

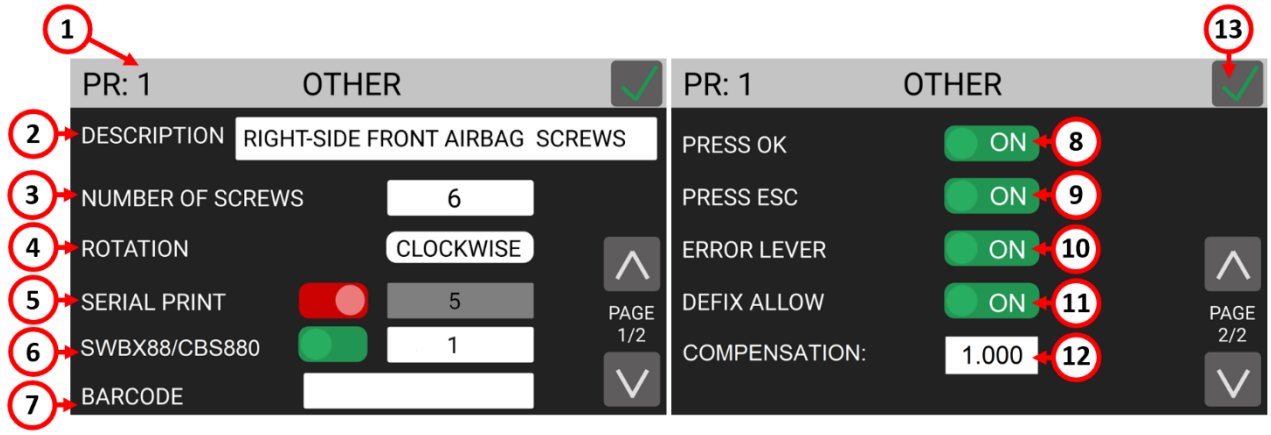
(7) AUTO-REV DELAY

The amount of idle time between the end of the tightening phase and the AUTO-REVERSE AFTER TORQUE phase. The lever must remain pressed or the remote start command must remain active during this idle time. Cannot be set to less than 0.3 seconds. Only active if the AUTO-REVERSE AFTER TORQUE function is not OFF.

(8) Exit/Save Key

Tap to return to the previous menu and save or discard any changes made.

OTHER menu



(1) Program number

Indicates the program that is currently being edited. You can select a different program to edit from the previous screen.

(2) DESCRIPTION

Tap to enter a program description of up to 28 alphanumeric characters. The description will be displayed in the main screen.

(3) NUMBER OF SCREWS

Tap to set the number of screws (0 to 99) for this program. Also referred to as “batch size” in the industry. The end of program signal will be raised upon the successful tightening of the last screw in the program.

Enter zero to disable screw counting for this program.

Note: a program with NUMBER OF SCREWS set to zero behaves the same as a program with NUMBER OF SCREWS set to one when utilized in a sequence (SEQUENCE menu).

(4) ROTATION

Tap to set the direction of rotation of the screwdriver for the tightening phase. All of the screwdriver functions (angle measurements, direction of rotation for reverse phase, etc.) will adapt to the selected direction of rotation.

(5) SERIAL PRINT

Tap to enable and set a value from OFF to 5. The value identifies the number of line feeds (empty lines) printed between a results string and the next on the serial port and serial printer accessory.

(6) SWBX88/CBS880

Tap to enable and utilize the SWBX88 or CBS880 Kolver accessories with the current program being edited.

Enter 1 through 8 to assign the current program (1st setting from above) number to the corresponding physical slot (1 through 8) of the Kolver accessory.

(7) BARCODE

Tap to enter the SCAN BARCODE screen to assign a barcode to the current program being edited. To be used in conjunction with the BARCODE MODE: - ON PRG - in the GENERAL SETTINGS menu.

The barcode can be up to 16 alphanumeric characters. QR codes of up to 16 alphanumeric characters are supported, provided that the scanner is configured correctly (RS-232, 9600 baud, 8 data bits, 1 stop bit, no parity, terminators CR-LF).

(8) PRESS OK

If ON, the “press OK” screen will appear upon successful completion of the last screw of the program.

When this screen appears, the screwdriver will remain disabled until the operator taps OK on the touch screen, or until the “REMOTE OK” external signal is received.

If OFF, the control unit will reset automatically when the lever is pressed or the remote start signal is received after the last screw of the program is successfully completed.

Note: the “press OK” screen will not appear if the NUMBER OF SCREWS is set to zero, even if enabled. If you want the “press OK” screen to appear after every screw, set NUMBER OF SCREWS to one.

Note: this setting is ignored if the program is being used within a sequence (job). The program transition setting within the sequence will define the behavior in this case.

(9) PRESS ESC

If ON, the “press ESC” screen will appear whenever an error occurs during a tightening or untightening operation.

When this screen appears, the screwdriver will remain disabled until the operator taps ESC on the touch screen, or until the "REMOTE ESC" external signal is received.
If OFF, the control unit will clear the error automatically when the lever is pressed or the remote start signal is received after the error occurs (in this case, the remote start signal must first be pulled down after the error occurs in order to re-start the tightening).

(10) LEVER ERROR

If ON, an error will be raised if the lever is released before reaching the target torque, angle, and/or run time.
If OFF, releasing the lever in the middle of a tightening will not result in an error signal, even if the target torque, angle, and/or run time have not been reached.

(11) DEFIX ALLOW

If ON, the reverse button on the screwdriver is enabled.
Set to OFF to disable the reverse button on the screwdriver.
Note: the PRE-TIGHTENING REVERSE and AUTO-REVERSE AFTER TORQUE functionality can still be used when this setting is OFF.

(12) COMPENSATION

This setting changes the calibration factor for the current program. Default value is 1. The torque measured when working with the current program is multiplied by this factor. For example, if a torque value of 3 Nm is displayed with the COMPENSATION setting at 1, but you measure an effective torque value of 3.03 Nm with an external measurement tool, you modify the COMPENSATION setting to 0.99. Repeating the tightening with the same joint should now yield a torque value of 3 Nm (result of 3.03 Nm * 0.99) in both the K-DUCER and the external torque measurement tool.
This function is useful when the torque result measured by an external instrument is not in line with the result measured by the K-DUCER, provided you are sure that the external instrument is properly calibrated and showing the correct result.
This can happen when working on rigid joints or with angle heads, or when the KDS screwdriver is overdue for a calibration.
WARNING: This function changes the value of the factory FATC calibration of the KDS screwdriver and therefore must be used only in case of real need and with a full understanding of what is being modified. In all other cases it should be left at 1. Contact your Kolver representative when in doubt.
Kolver supplies all KDS series screwdrivers with the transducer pre-calibrated on a semi-elastic joint at a final speed of 100RPM (KDS models 15Nm and smaller) or 50RPM (KDS models 20Nm and larger).

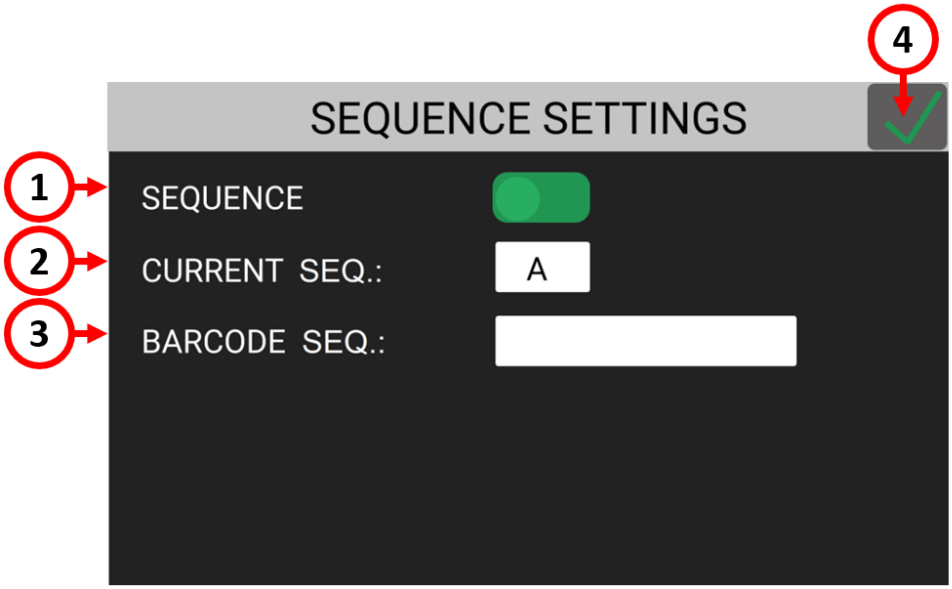
(13) Exit/Save Key

Tap to return to the previous menu and save or discard any changes made.

SEQUENCE SETTINGS menu

Sequences, also referred to as “jobs” in the industry, are ordered series of up to 16 programs with the option to define how to transition between programs.
With the K-DUCER series, you can define up to 8 different sequences as well as assign a barcode (limited QR code support) to each for automatic selection via a barcode scanner.

Tap the Sequence Settings button from the main menu to enter the sequence menu.



(1) SEQUENCE toggle

Tap the toggle to activate sequence mode in the main screen and work with sequences.

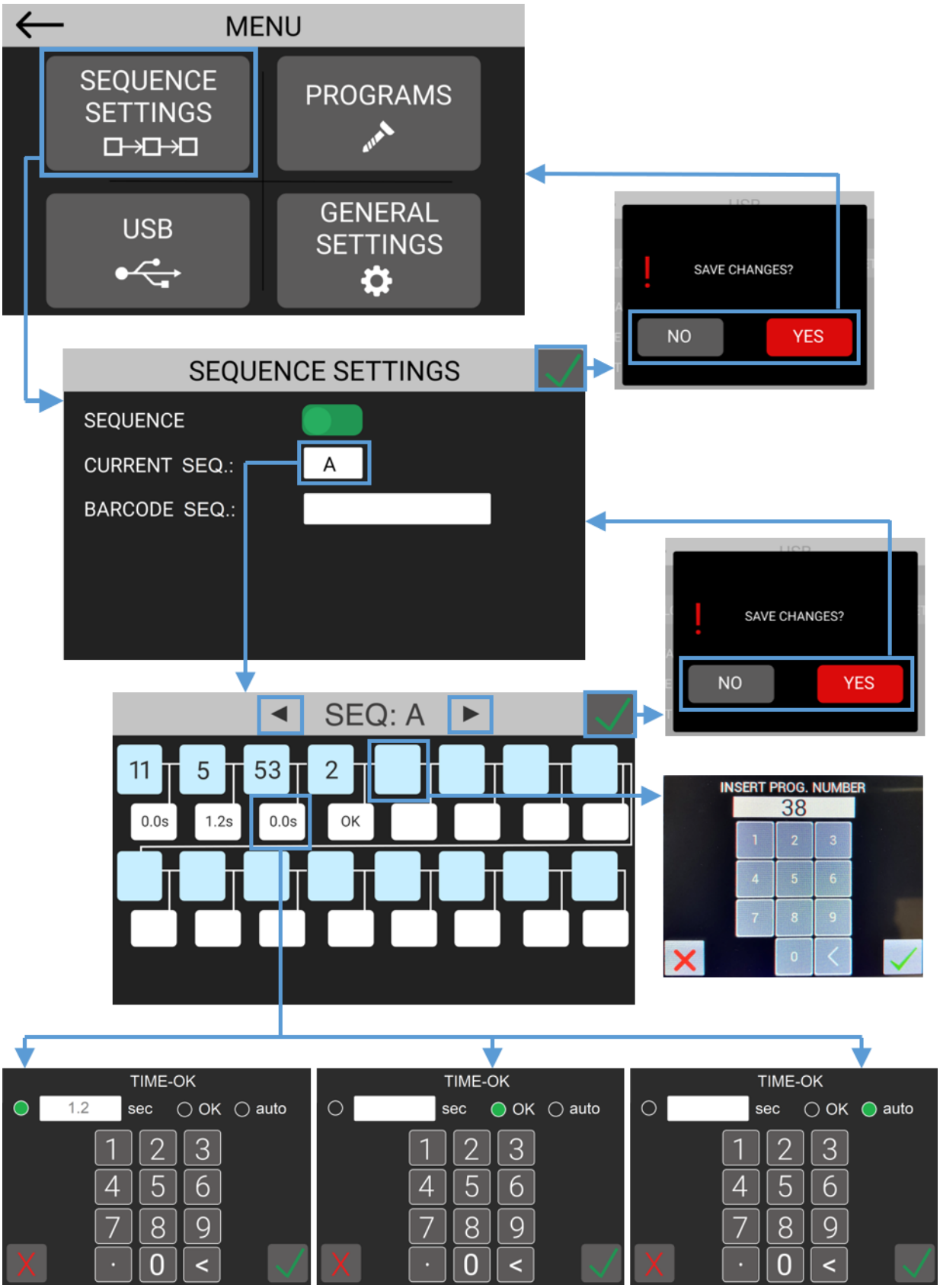
(2) CURRENT SEQ.

Tap the CURRENT SEQ. input field to enter the sequence edit menu for one of 8 sequences (A through H).
The sequence shown in the CURRENT SEQ. input field corresponds to the pre-selected sequence in the main screen.
You can also select a different sequence to work with directly from the main screen.
Manual selection of sequences is disabled if you utilize BARCODE MODE: - ON SEQ - in the GENERAL SETTINGS menu.

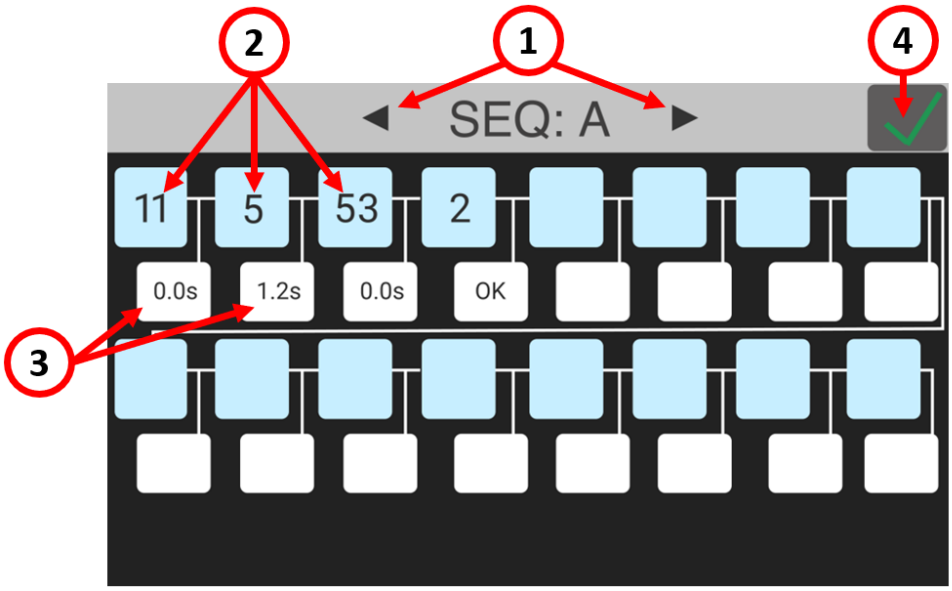
(3) BARCODE SEQ.

Tap to enter the SCAN BARCODE screen to assign a barcode to the sequence shown in CURRENT SEQ. To be used in conjunction with the BARCODE MODE: - ON SEQ - in the GENERAL SETTINGS menu.
The barcode can be up to 16 alphanumeric characters. QR codes of up to 16 alphanumeric characters are supported, provided that the scanner is configured correctly (RS-232, 9600 baud, 8 data bits, 1 stop bit, no parity, terminators CR-LF).

SEQUENCE SETTINGS menu tree



CURRENT SEQ. menu



(1) Sequence letter

Indicates the sequence that is currently being edited.

Tap the arrows to select a different sequence to edit (A through H).

(2) Program number box

Tap to change or insert a program into the sequence. The sequence flows left to right, top to bottom.

You can insert any of the 64 programs into any of the 16 spots in the sequence. You can also insert the same program in different boxes if desired.

(3) Program transition box

Tap the box to define the transition behavior between the two corresponding programs in the sequence.

The transition behavior can be:

Time: when the previous program is successfully completed, the unit will automatically switch to the next program after the set amount of time, in seconds. The screwdriver will remain disabled until the transition timer completes. The timer begins counting as soon as the program is completed, even if the lever is not depressed or the remote start command is not removed.

Note: a transition time of zero seconds still requires the screwdriver lever or the remote start command to be released in order for the unit to switch to the next program.

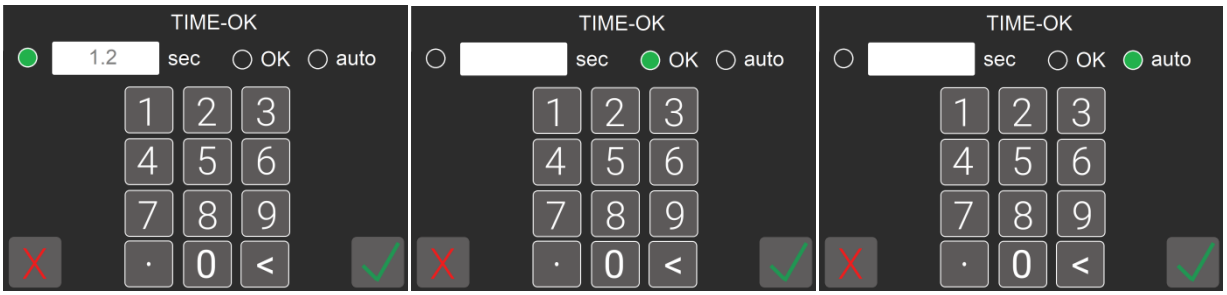
OK: when the previous program is successfully completed, the “press OK” screen will appear.

When this screen appears, the screwdriver will remain disabled until the operator taps OK on the touch screen, or until the “REMOTE OK” external signal is received.

Auto: when the previous program is successfully completed, the unit will immediately switch to the next program WITHOUT having to depress the screwdriver lever or pull down the remote start command. This setting can be useful if you require multiple closing torques or angles on the same joint without stopping in between, or to create a

screwdriving operation that is not otherwise possible within the parameters of a single program.

WARNING: use this transition setting with care and only when strictly necessary, as the operator will not have any time to react to the program change.

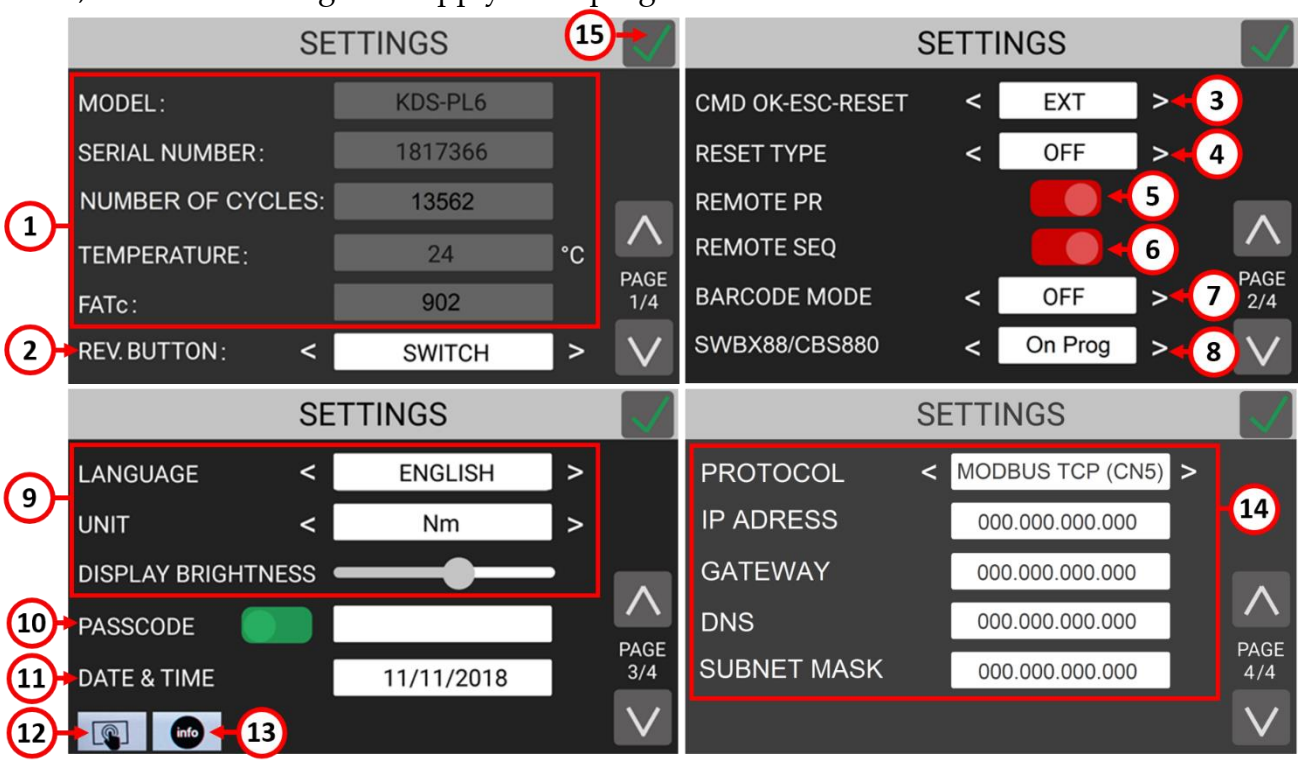


(4) Exit/Save Key

Tap to return to the previous menu and save or discard any changes made.

GENERAL SETTINGS menu

Tap the General Settings button from the main menu to enter the general settings menu. In this menu you can find information on the current KDS series screwdriver connected, configure Kolver accessories, configure I/O communications, add a password lock to the menu, and other settings that apply to all programs.



(1) TOOL INFO

Shows information of the connected screwdriver:
MODEL: the model of the connected screwdriver.
SERIAL NUMBER: the serial number of the connected screwdriver.
NUMBER OF CYCLES: the total cumulative number of cycles performed by the screwdriver. Also see MAINTENANCE AND CARE section.
TEMPERATURE: the temperature measured near the motor of the screwdriver, in degrees °C.
Note: exceeding a temperature of 40 °C will put the screwdriver in error protection mode and lock it until it cools down below 37 °C.
Some factors that can overwork and overheat the screwdriver include:

- Combination of high torque and low speed on very elastic joints (the screwdriver delivers high torques more efficiently at higher speeds)
- Very high duty cycles (< 3 seconds between rundowns), depending on difficulty (torque/elasticity) of the rundown
- High torques are defined as above 80% of the maximum nominal torque for the KDS screwdriver model. Consider upsizing the screwdriver model if most of your cycles are > 80% of the maximum torque

FATc: the calibration value of the transducer, also available in the calibration certificate of the tool). Modifying this value requires a Service Passcode. Contact Kolver to schedule a factory re-calibration or to obtain the service passcode and calibration instructions to perform the re-calibration in-house.

(2) REVERSE BUTTON

Defines the behavior of the reverse button on the KDS screwdriver and on the remote reverse command. The two modes available are BUTTON and SWITCH.

BUTTON mode: the screwdriver will run in reverse only while pressing the reverse button on the KDS screwdriver or while sending the remote reverse command.

SWITCH mode: pressing and releasing the reverse button on the KDS screwdriver or sending the remote reverse command will activate the reverse mode on the KDS screwdriver. Press the lever on the KDS screwdriver or send the remote start command while in this mode to make the screwdriver run in reverse. The LEDs on the screwdriver will flash while this mode is active and the screwdriver is not turning.

(3) CMD OK-ESC-RESET

Changes the source for the commands "OK", "ESC" (see "press OK" and "press ESC" settings on the PROGRAMS > OTHER menu), and "RESET" (see (4) below).

Choose "**INT**" (internal) to only allow these inputs from the touch screen display.

Choose "**EXT**" (external) to only allow these inputs to be received via external signals on the CN3 connector.

Choose "**INT+EXT**" to allow the OK/ESC/RESET commands from both the touch screen display and the external signals on CN3.

(4) RESET TYPE

Defines the behavior of the reset ("RST") button and external reset signal.

OFF mode: disables the reset button and external signal.

PRG: resets the screws made counter of the current program to zero.

SCREW: decreases the screws made counter of the current program by one.

SEQ: resets the current sequence back to the first program and resets the screws made counter to zero. This option is will only appear if SEQUENCE mode is active (SEQUENCE toggle > ON).

If any barcode mode is active and the current Screw count is zero, the RST button/signal will also cause the "scan barcode" screen to reappear.

(5) REMOTE PR

Toggle this to enable program selection via external input signals on the CN3 connector. Refer to the remote I/O chapter of this manual for more information.

(6) REMOTE SEQ

Toggle this to enable sequence selection via external input signals on the CN3 connector. Refer to the remote I/O chapter of this manual for more information.

(7) BARCODE MODE

Choose between OFF or one of five barcode modes:

OFF: disables/ignores barcode scans and settings

On S.N. ("on Serial Number"): on the main screen, the scan barcode screen will appear. Scanning a barcode will temporarily associate it with the current program. The barcode

will be printed in the corresponding results string on the serial port and on the corresponding Modbus field (see serial print and remote I/O chapters on this manual). The scan barcode screen will appear again after the current program completes on when a new program number is selected.

On PROG: on the main screen, the scan barcode screen will appear. Scanning a barcode will load the program containing the matching barcode. If there is no program with a matching barcode, the operator will be prompted to scan another barcode. The scan barcode screen will appear again after the loaded program completes. You can configure a unique barcode for each program via PROGRAM > OTHER > BARCODE.

On SEQ: on the main screen, the scan barcode screen will appear. Scanning a barcode will load the sequence containing the matching barcode. If there is no sequence with a matching barcode, the operator will be prompted to scan another barcode. The scan barcode screen will appear again after the loaded sequence completes. You can configure a barcode for each sequence via the BARCODE SEQ. setting on the SEQUENCE SETTINGS menu. This option is will only appear if SEQUENCE mode is active (SEQUENCE toggle > ON).

SN+Prog: This mode combines the "On Serial Number" and "On PROG" modes. First, the "scan serial number barcode" screen will appear. Then, after the first scan, the "scan PROG barcode" screen will appear. The program containing the barcode matching the "PROG" scan (second scan) will be loaded, while the first barcode scanned ("serial number") will be printed with the screwdriving results.

Both "scan barcode" screens will reappear after the program completes.

SN+Seq: This mode combines the "On Serial Number" and "On SEQ" modes. First, the "scan serial number barcode" screen will appear. Then, after the first scan, the "scan SEQ barcode" screen will appear. The sequence containing the barcode matching the "SEQ" scan (second scan) will be loaded, while the first barcode scanned ("serial number") will be printed with the screwdriving results.

Both "scan barcode" screens will reappear after the sequence completes.

(8) SWBX88/CBS880

Changes the working mode for the SWBX88 and CBS880 Kolver accessories:

OFF: disabled

ON PROG: the position selected on the accessory will load the program number containing the matching SWBX88/CBS880 setting (Programs > Other > SWBX88/CBS880).

ON SEQ: the position selected on the accessory will load the corresponding sequence. This sequence letters are matched to the numbers alphabetically (A-1, B-2, …, H-8). This option is will only appear if SEQUENCE mode is active (SEQUENCE toggle on the Sequence Settings menu).

Also see: Connecting Kolver accessories SWBX88, CBS880

(9) LANGUAGE / UNIT / BRIGHTNESSS

LANGUAGE: choose the display language: English, Italian, French, German, Spanish, Portuguese.

UNIT: choose the measurement units for torque: Nm, lbf.in, kgf.cm

DISPLAY BRIGHTNESS: increase or decrease the brightness of the touch screen display

(10) PASSCODE

Enables or disables the passcode lock for the configuration menu.
Tap the input field to enter a passcode, and enable the on/off toggle to activate it.
When the passcode is enabled, the lock icon on the main screen will have a red background, and the passcode will be required to access the configuration menu.
Should you forget the passcode, contact Kolver to obtain a master passcode.

(11) DATE & TIME

Tap to change the date and time of the unit. This changes the date and time associated with each (new) result reported in the serial print, usb, and modbus fields.

(12) TOUCH SCREEN CALIBRATION

Tap to enter the touch screen calibration function. Use this to correct problems with the alignment of the touch response of the display.
Touch the four blue dots with one finger where they appear on the screen. Contact Kolver if the problem persists.

(13) INFO

Tap to show the firmware versions loaded onto the unit and onto the connected KDS screwdriver.

(14) COMMUNICATION PROTOCOL

PROTOCOL: select the communication protocol to use between the following options:

K-EXPAND: to interface with the free K-EXPAND PC software via the MiniUSB port.
MODBUS TCP: to interface with any device supporting the MODBUS TCP protocol via the ethernet port.
OP: to interface with any device supporting Open Protocol via the ethernet port.

IP ADDRESS: the ethernet IP address of the K-DUCER unit. Must be assigned manually and be available/reserved in the local network, if applicable. The unit does not support DHCP assignment.
GATEWAY: the ethernet IP address of the local network gateway, if applicable. You can leave this as 0.0.0.0 in most cases.
DNS: the ethernet IP address of the local DNS server. You can leave this as 0.0.0.0 in most cases.
SUBNET MASK: the subnet mask of the local network. The value must match the subnet mask of the other devices in the LAN. Usually this value is 255.255.255.0. Note that 0.0.0.0 will not work in most cases. Contact your IT support if unsure.
MAC ADDRESS: shows the MAC address of the K-DUCER (v35 and later).

Note: to find the MAC address of the K-DUCER unit with firmware versions v34 and earlier: set COMMUNICATION PROTOCOL to OP or MODBUS TCP, then connect to a PC connected to the same LAN network. If connecting CN5 directly to an ethernet port on your PC, make sure to set your PC's IP address to static with the same subnet mask of the K-DUCER.

For example:

K-DUCER IP address:	192.168.1.12
PC IP address (static):	192.168.1.13
SUBNET MASK for both:	255.255.255.0

Then, from your PC, open the windows command prompt, and type the following:
`arp 192.168.1.12 -a`
The response will show the MAC address of the K-DUCER.

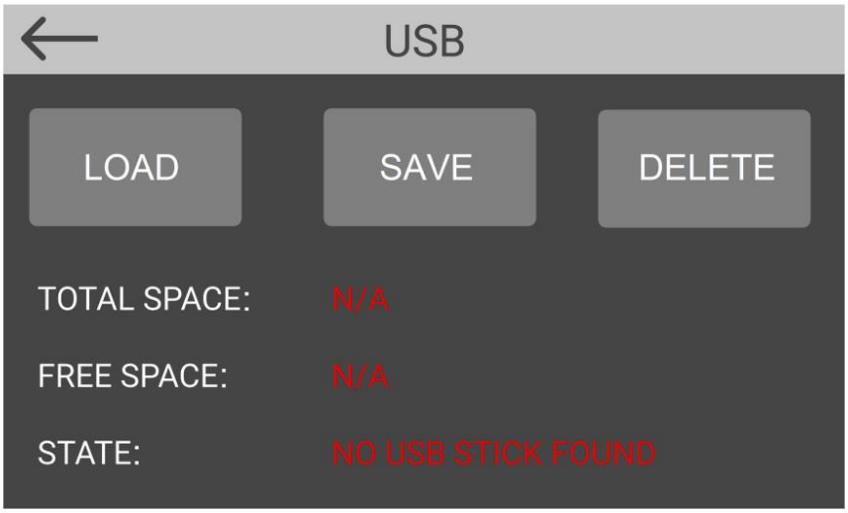
Alternatively, contact your Kolver representative to schedule an update to the latest firmware version.

(15) Exit/Save Key

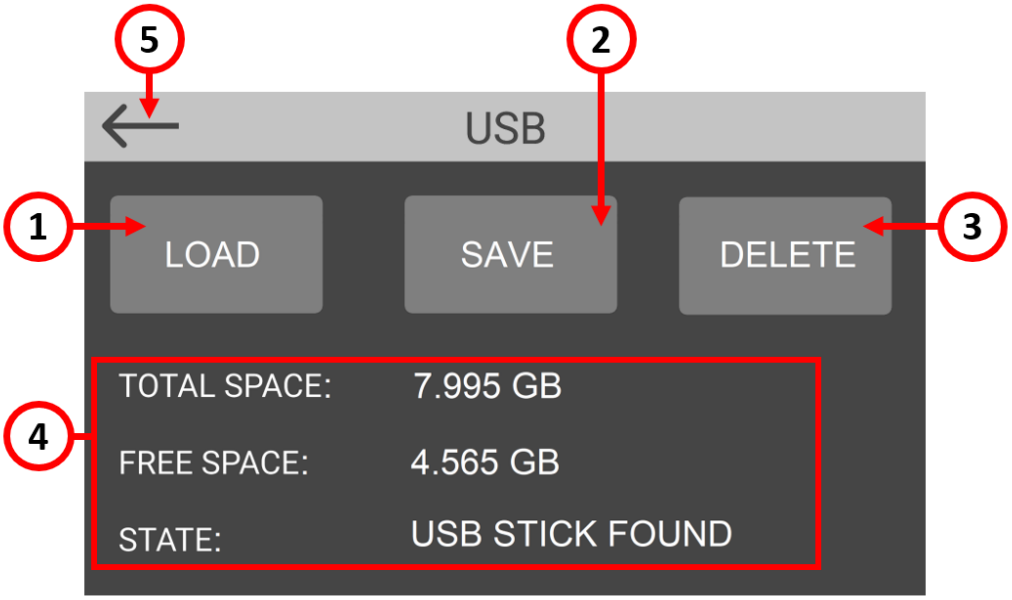
Tap to return to the previous menu and save or discard any changes made.

USB menu

Tap the USB button from the main menu to enter the USB menu.
From this menu you can save and recall the K-DUCER configuration containing all program parameters, sequence parameters, and general settings, from a USB drive connected to the USB type-A port on the bottom of the unit.
Note: use the USB type A port for this function, not the mini-USB port.
Note: the USB drive must be formatted with the FAT32 filesystem.
If there is no USB drive connected, or if the USB drive is not formatted with FAT32 filesystem, the following screen will appear. Connect a properly formatted USB drive to correct this error.



If a properly formatted USB key is connected, the load/save/delete buttons will be enabled:



(1) LOAD programs button

Tap to display a list of KDU files found in the root directory of the USB drive.

Select the desired KDU file -the selected file will be highlighted in green-, previously saved from a K-DUCER unit or from the freely available K-EXPAND software for PC, then tap load to load the configuration onto the K-DUCER control unit.

(2) SAVE programs button

Tap to save the configuration of the K-DUCER control unit, including all program parameters, all sequence parameters, and all general settings, onto the connected USB drive. You will be prompted to enter a name for the configuration file. The file will have a .kdu extension and can be loaded onto this or other K-DUCER units or onto the freely available K-EXPAND software for PC.

(3) DELETE programs button

Tap to display a list of KDU files found in the root directory of the USB drive. Select a file -the selected file will be highlighted in green- and tap delete to delete it. Tap "Format Drive" to delete all files from the USB drive.

WARNING: all deleted files using the "delete" and "format drive" functions are permanently deleted and unrecoverable.

(4) USB drive information

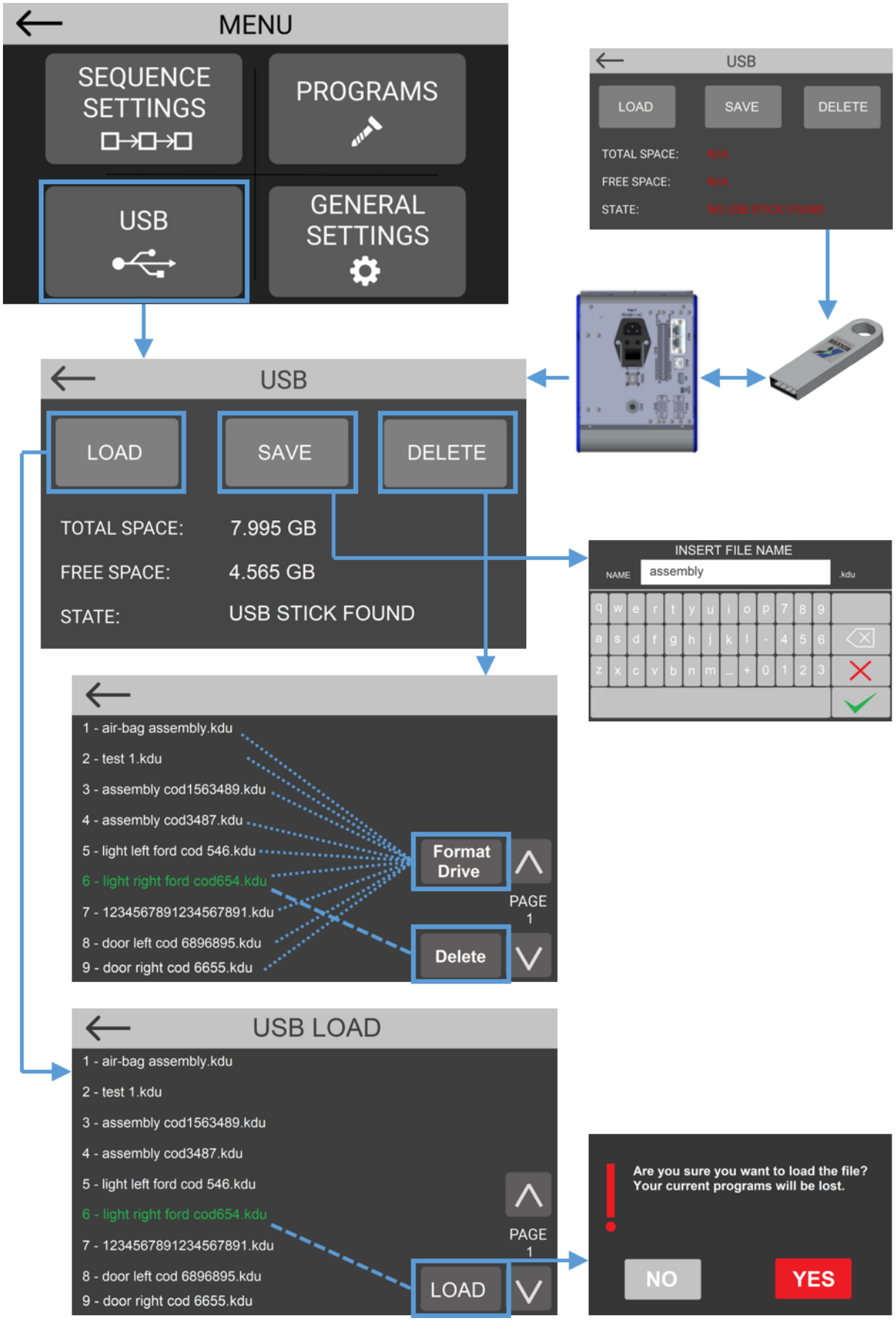
Shows the total space and available space of the connected USB drive, and whether a properly formatted USB drive is connected to the USB type-A connector on the K-DUCER unit.

Note: the unit can store about 7 million screwdriving results (cycles) for each GB of available space in the USB drive.

(5) Exit button

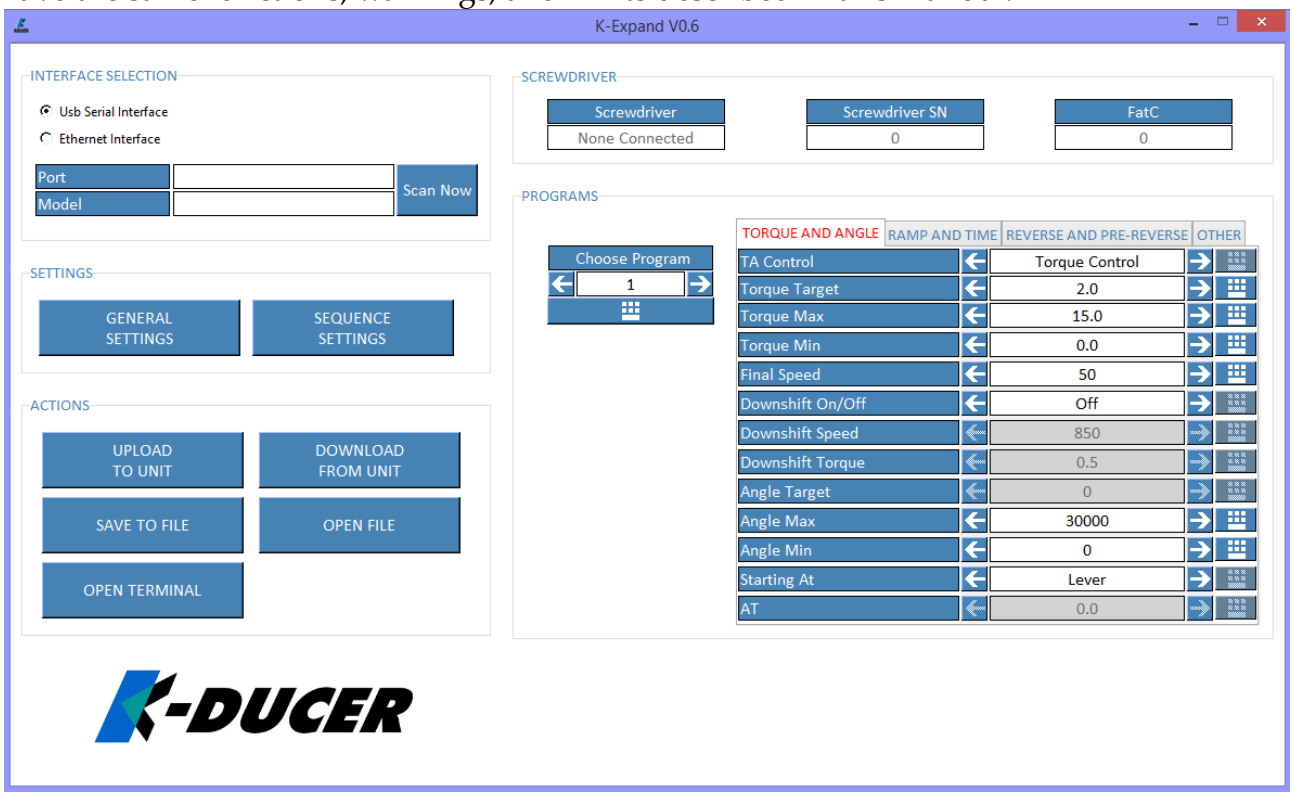
Tap to exit the USB menu.

USB menu tree



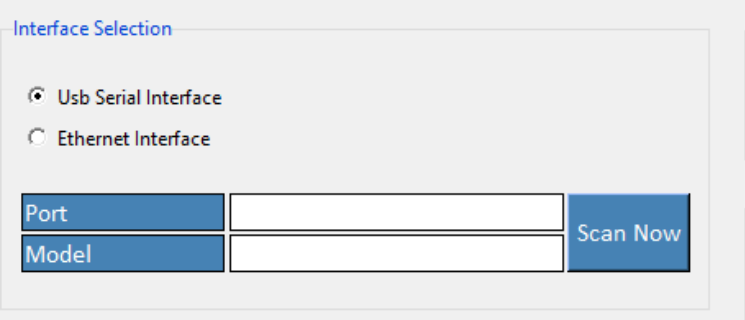
K-EXPAND software

K-EXPAND is the free software for pc created by Kolver to set, change, and save all parameters of the K-DUCER control unit.
It also offers a terminal to display the screwdriving results as well as torque/angle vs time charts in real time (at the end of each rundown).
Double click the icon program and the main view will appear. This is also the screen that appears when you create a new program or when one has been recalled from the connected unit. The parameters that are displayed are the same as those inside the K-DUCER unit and have the same functions, warnings, and limits described in this manual.



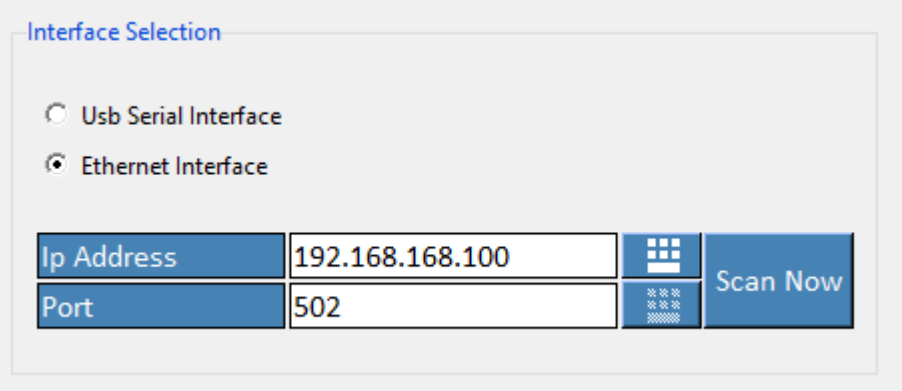
Interface Selection

To connect the K-DUCER to the K-Expand software, you can use either the Mini USB port (KDU1 and KDU1A) or the ethernet port (KDU1A only) on the back of the K-Ducer.
The K-EXPAND software can work with either of these two interfaces, just ensure that the K-DUCER unit communication protocol (COMMUNICATION PROTOCOL) matches the one selected in the K-Expand software.
With the USB Serial interface, simply connect the Mini-USB port on the back of the K-Ducer to a USB port on your PC and click “Scan Now”.

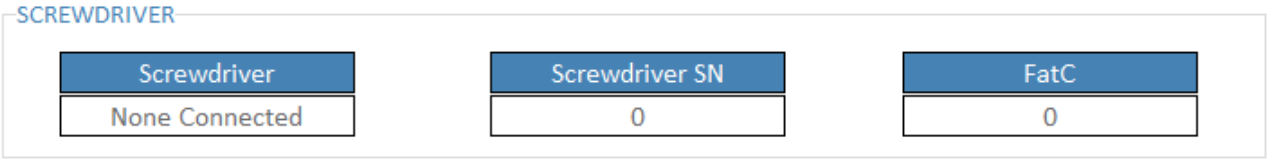


If the scan fails, try re-installing the VCP drivers for your system from https://ftdichip.com/drivers/vcp-drivers/ , or switch to the ethernet interface.

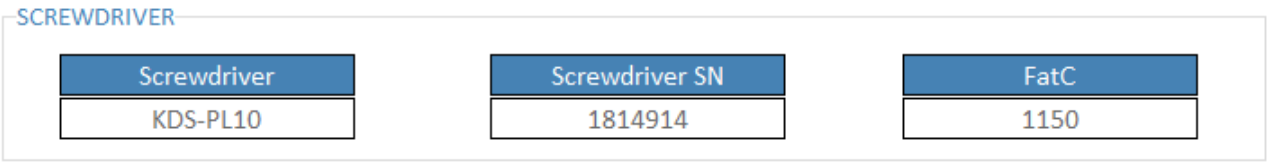
To use the ethernet interface, connect the PC using K-Expand and the K-DUCER to the same LAN network (or directly to each other), then enter the K-DUCER IP address in the corresponding K-Expand field:



Screwdriver



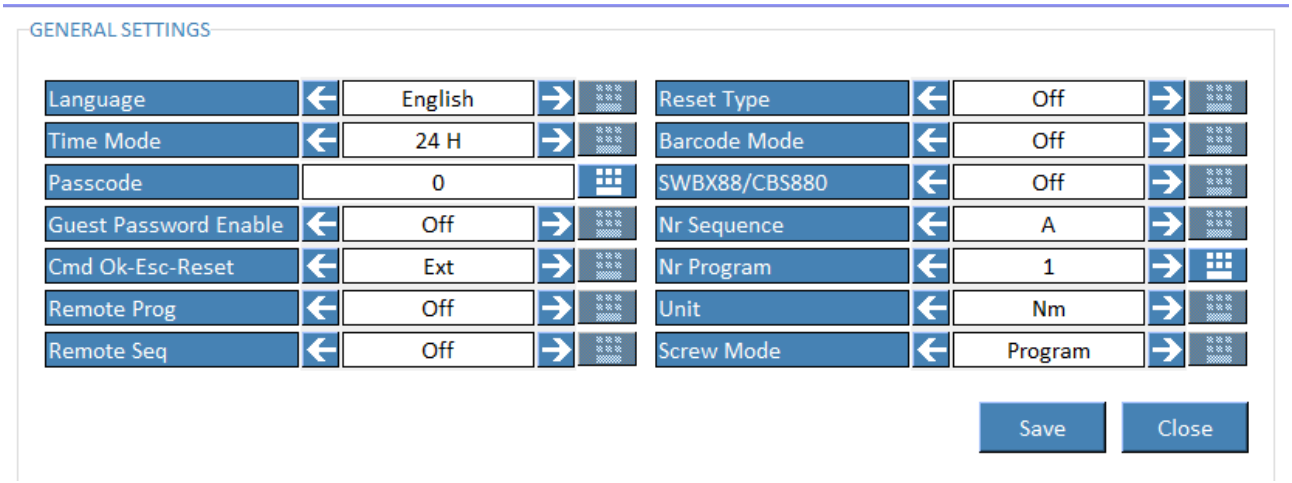
Once the screwdriver is connected to the K-DUCER, K-Expand recalls its model, serial number and FaTC:



Settings

Click “GENERAL SETTINGS” or the “SEQUENCE SETTINGS” menu to open the window containing the same settings found in the GENERAL SETTINGS menu and SEQUENCE SETTINGS menu:

General Settings

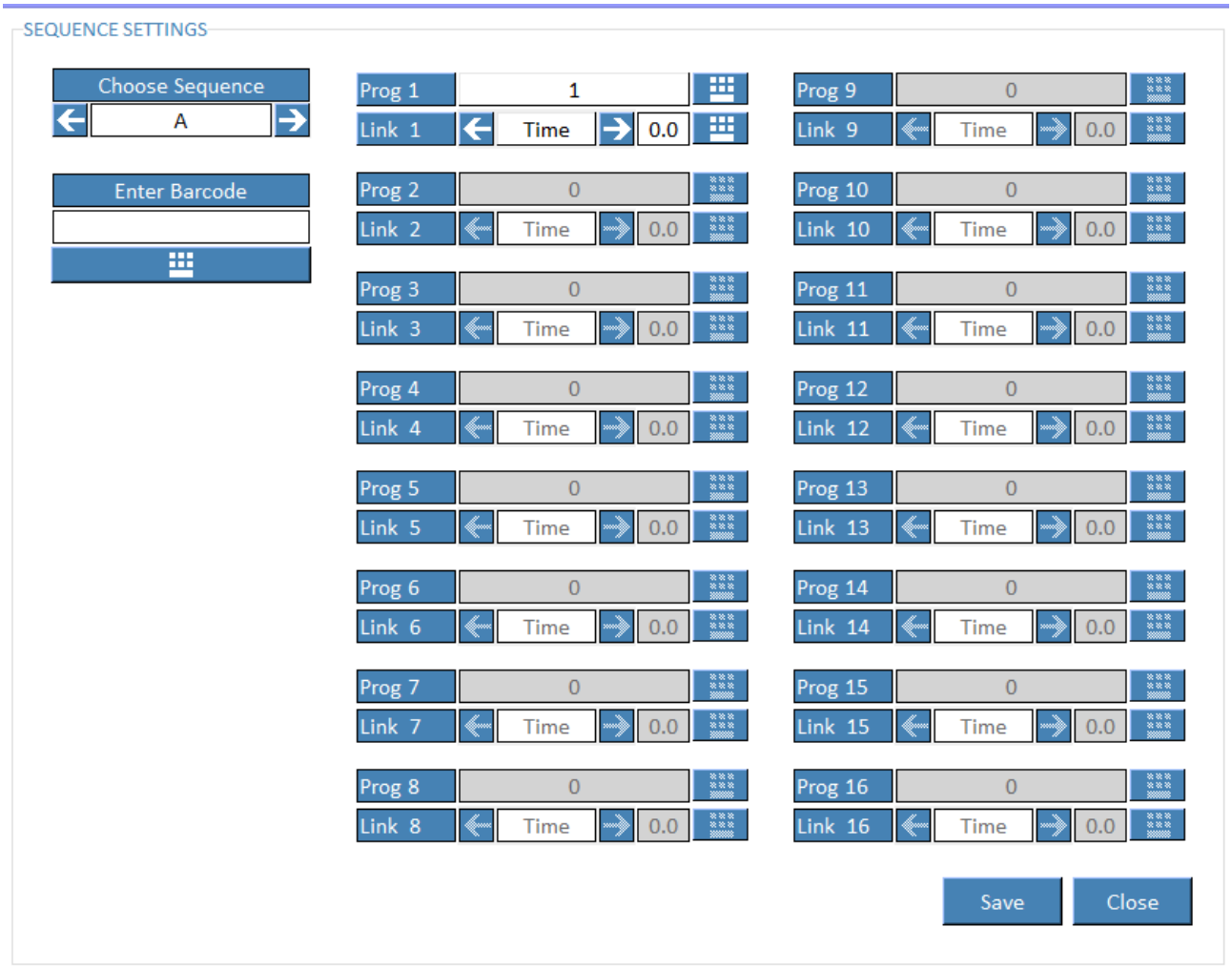


The following parameters not found directly in the K-DUCER touch screen menu have the following functions:

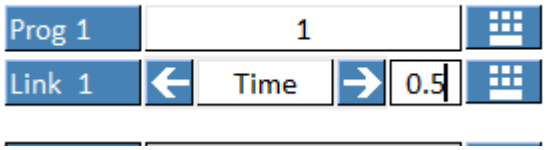
1. Screw Mode: Program or Sequence. This is equivalent to activating or de-activating the SEQUENCE toggle on the K-DUCER.
2. Nr Program: the current selected program on the K-DUCER (for program mode)
3. Nr Sequence: the current selected sequence on the K-DUCER (for sequence mode)
SEQUENCE SETTINGS

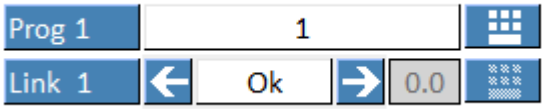
Click Save to apply the settings, or close to exit without saving. Note that the settings are only saved locally, they're not transferred to the K-DUCER unit until you click "UPLOAD TO UNIT".

Sequence Settings

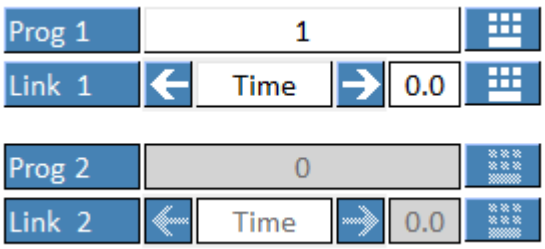


It is possible to select up to 8 sequences of up to 16 programs each. You must select the position of each program and the transition to move from one program to another, the same way as described in the CURRENT SEQ. menu.

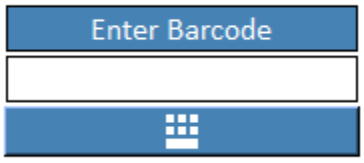




To enable further programs after the first one, simply double-click on the cells of the desired program number.



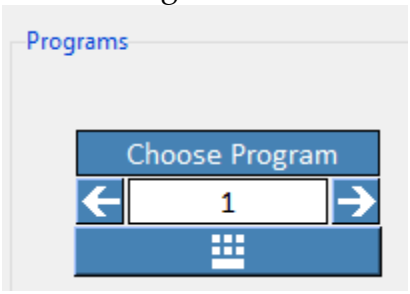
NB: It is not possible to leave empty positions in the definition of a sequence, for example it is not possible to enable a program in position 1 and one in position 3 without activating the program in position 2.
It is also possible to manually insert the bar code to be associated with the sequence:

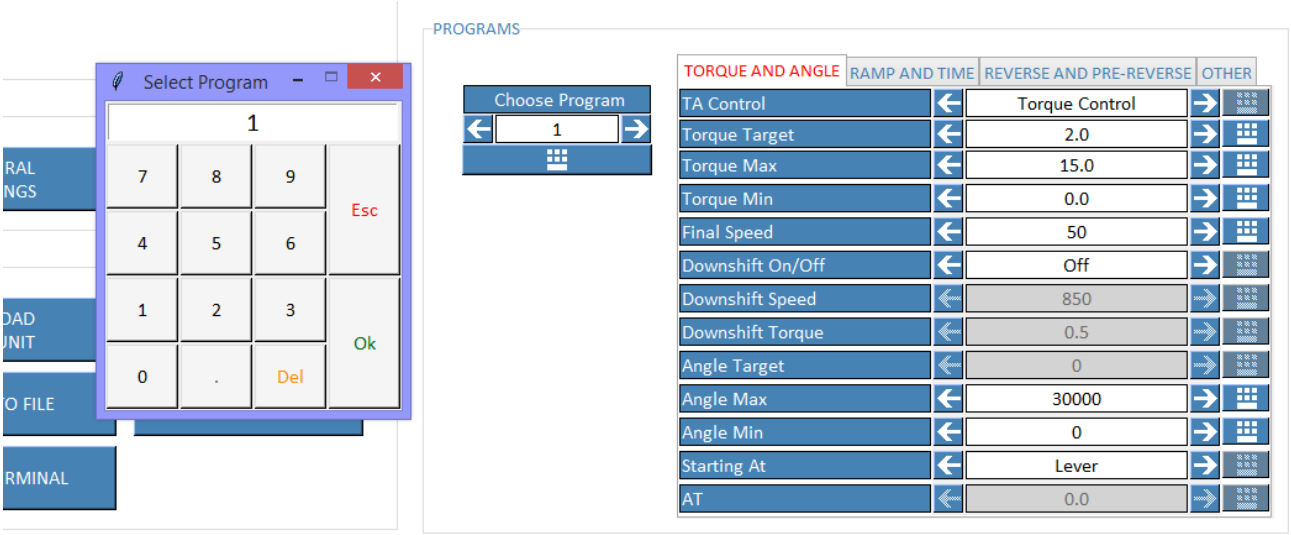


Click Save to apply the settings, or close to exit without saving. Note that the settings are only saved locally, they're not transferred to the K-DUCER unit until you click "UPLOAD TO UNIT".

Programs

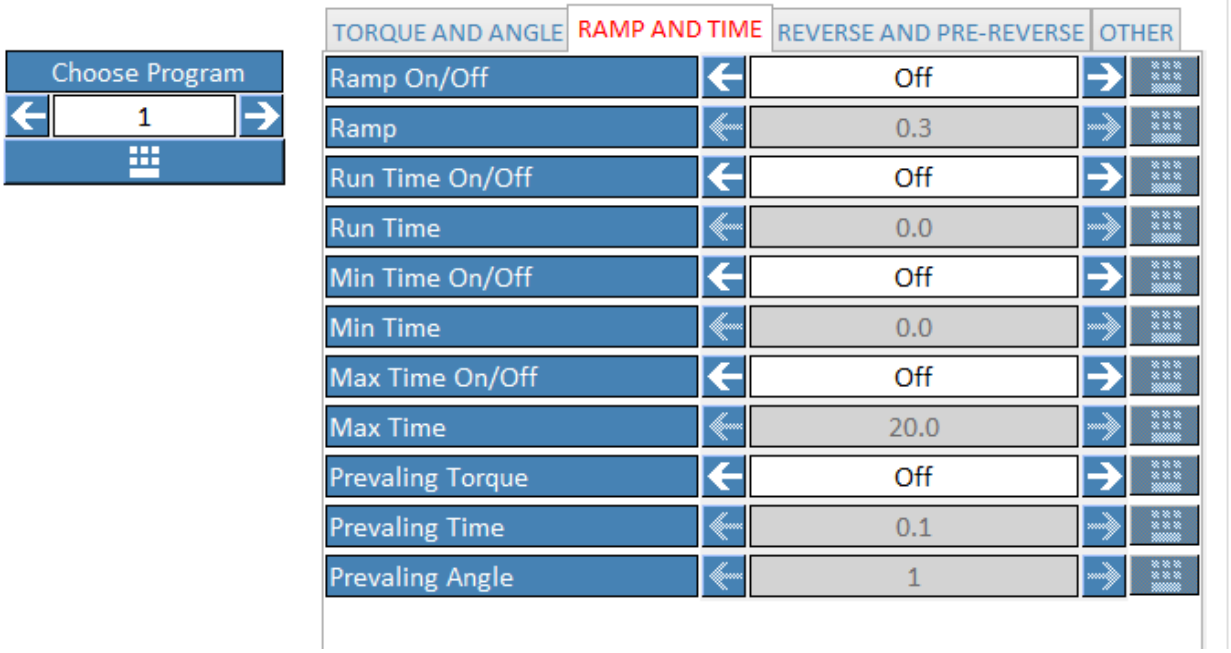
Choose Program : to enter the number of the program you want to view/ modify/ insert.



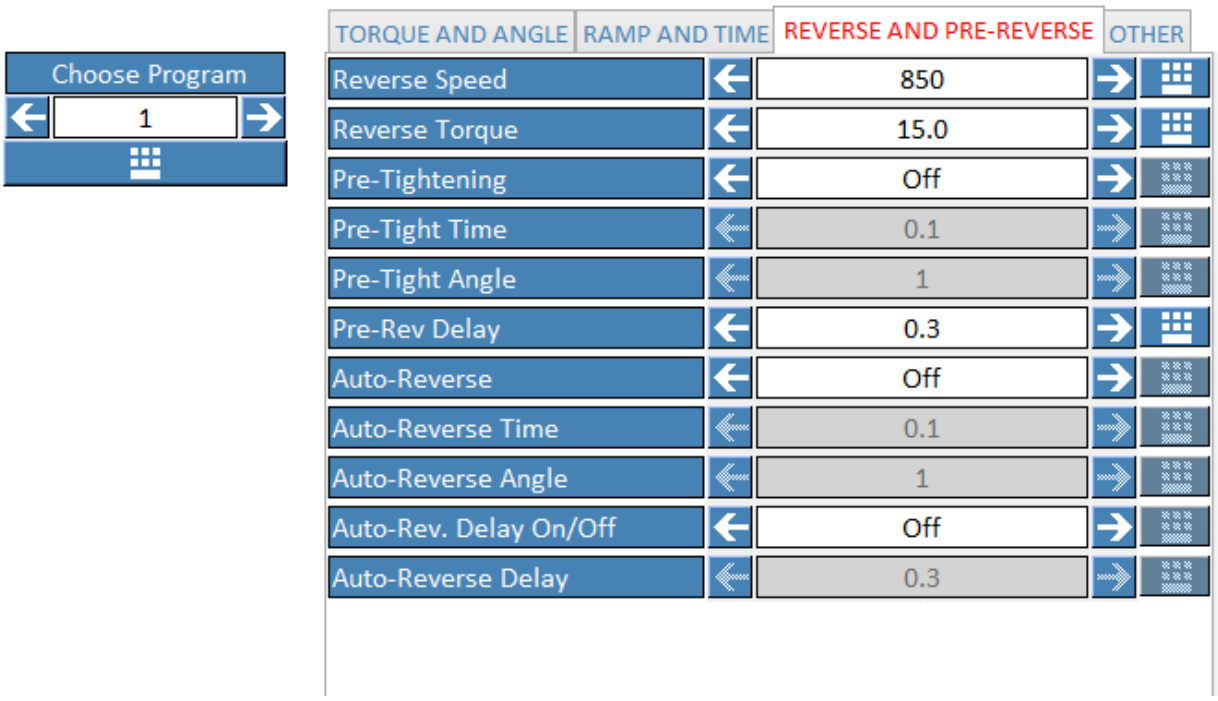


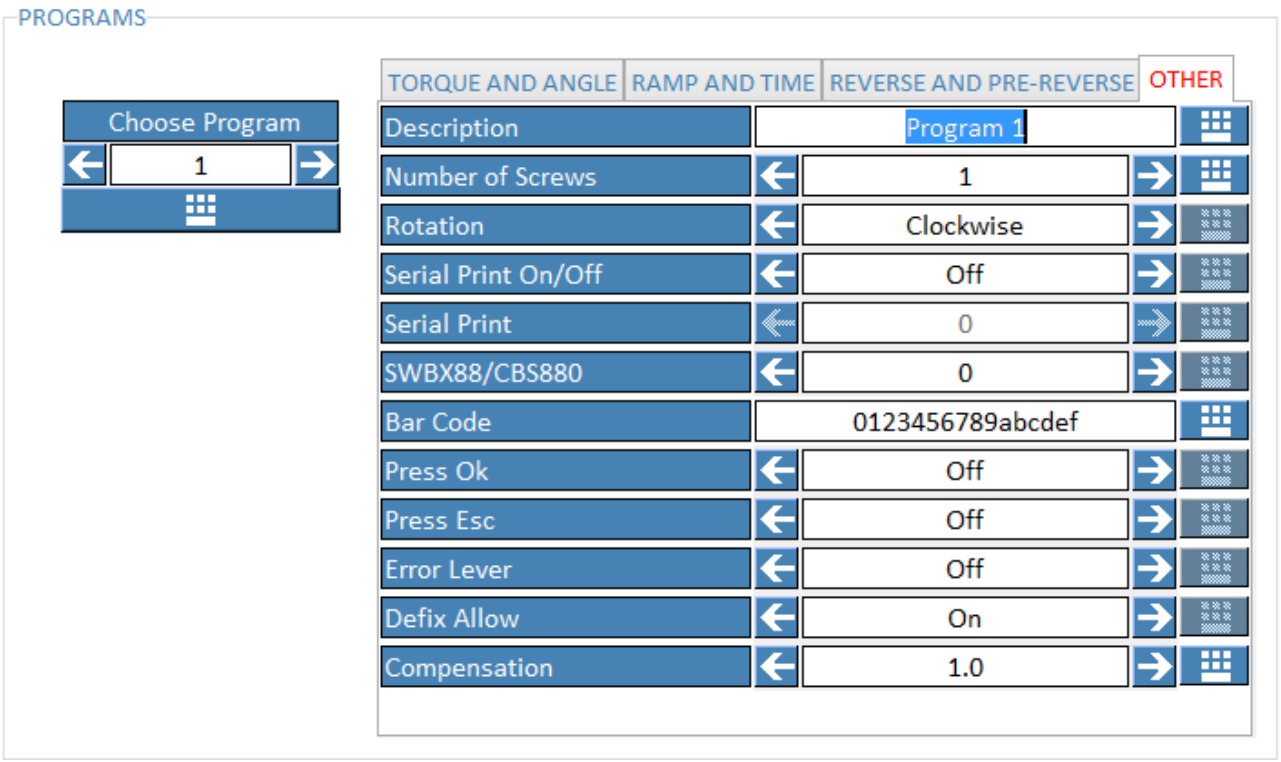
To move from one tab to another (Torque and Angle, Ramps and Time, Reverse and Pre-Reverse and Other), simply click on the desired tab. Each parameter is the same as the corresponding parameter on the K-DUCER unit. To change it, simply enter the cell, select a number in the correct range, then press Enter. Or you can press the keyboard button and type the desired value. The selection is saved automatically. If the choice is not in its range, the modification will be canceled by pressing Enter and an error message will be displayed to inform the user.

PROGRAMS

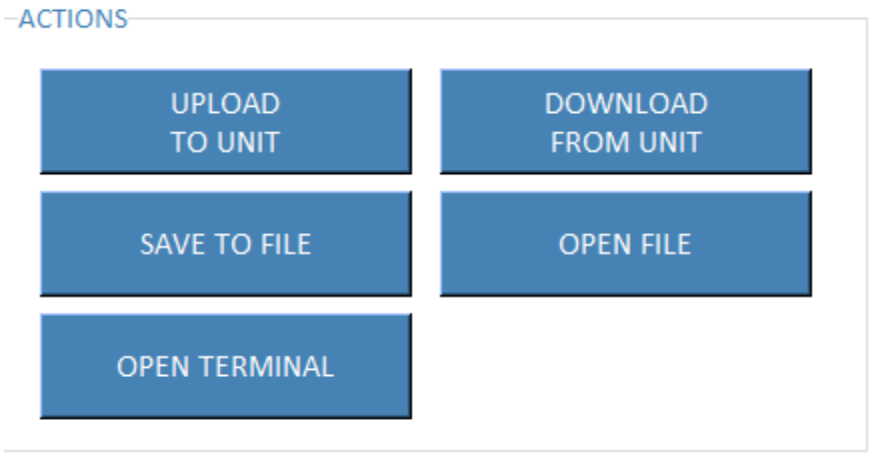


PROGRAMS



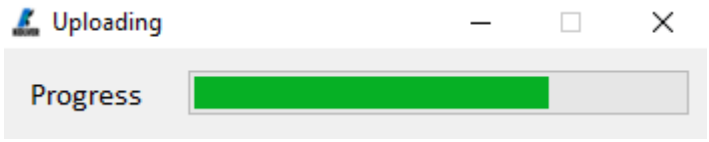


Actions



Upload to unit

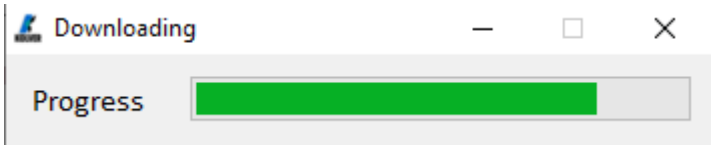
To upload all the setting to the KDU unit. The K-Ducer must first be connected and recognized using the "Scan Port" button.
Note: all of the settings of the K-DUCER will be overwritten with the ones from the K-Expand software.



In case of any connection error, an error message will be displayed.

Download from unit

To be used to recall all the settings from the control unit and display them in the K-Expand software. The K-Ducer must first be connected and recognized using the “Scan Port” button.

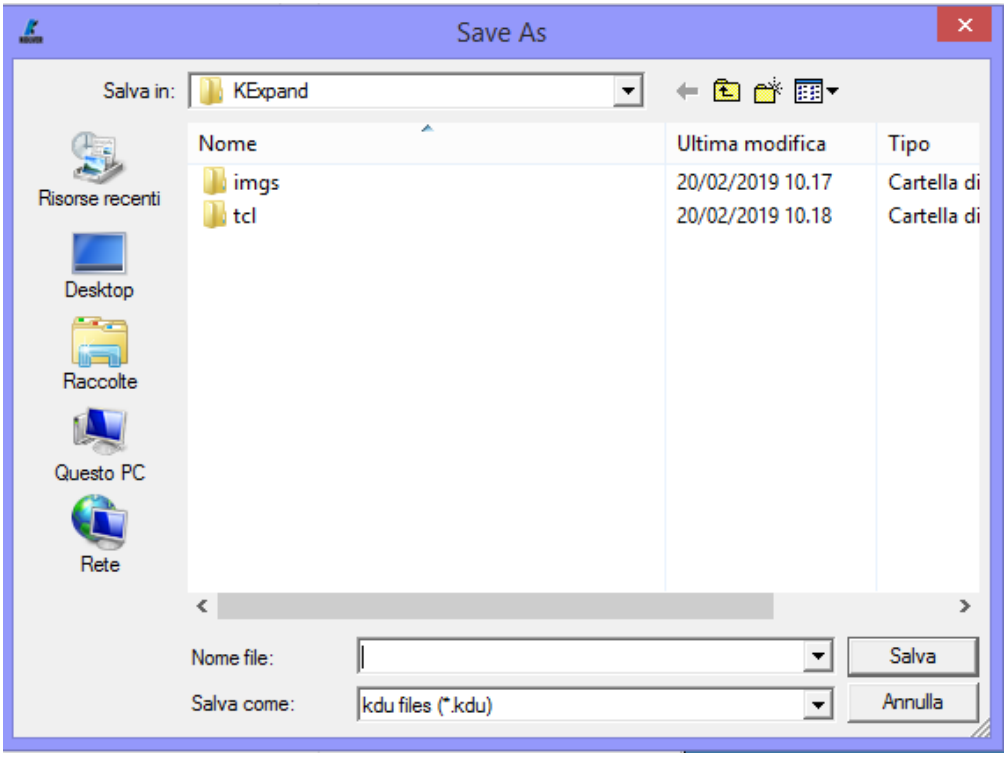


In case of any connection error, an error message will be displayed.

Save to file

Press Save to file to save all settings in a file. This file can be copied to the USB key and then loaded onto the unit or re-opened with the K-EXPAND software. The file extension is *kdu* and cannot modified.

There are no constraints on the name.

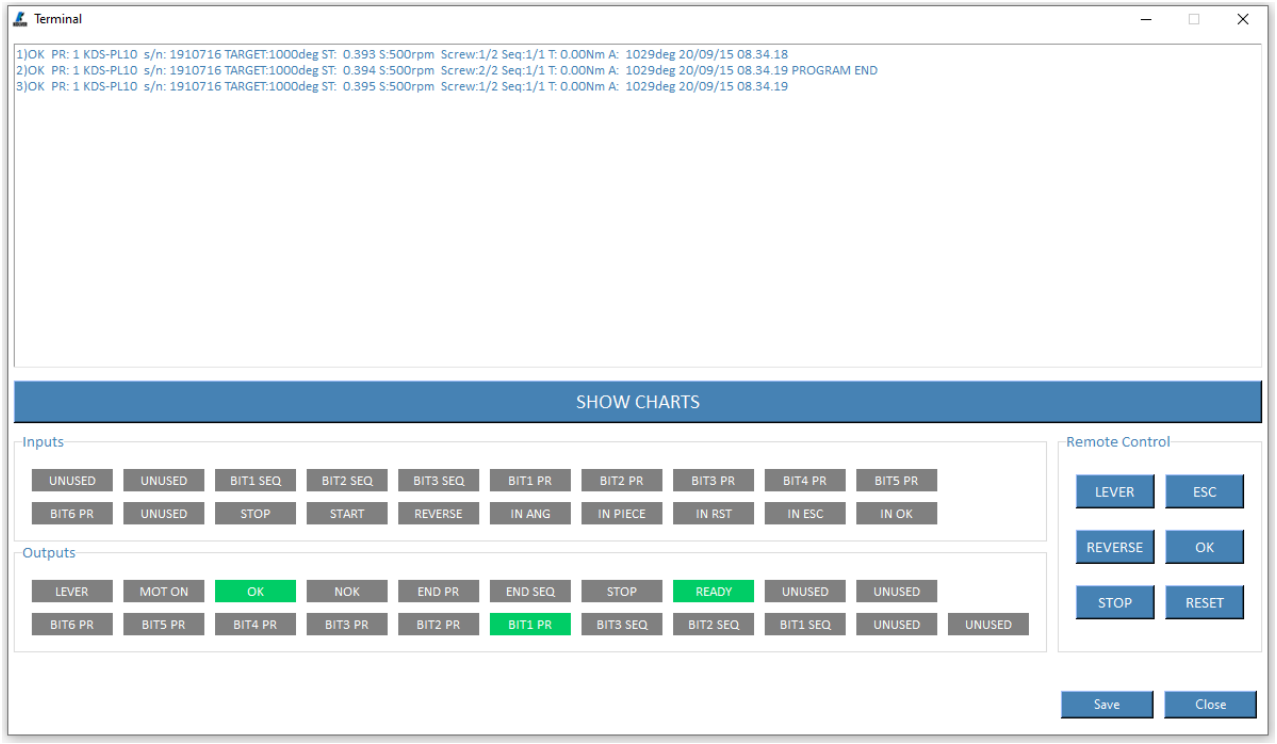


Open file

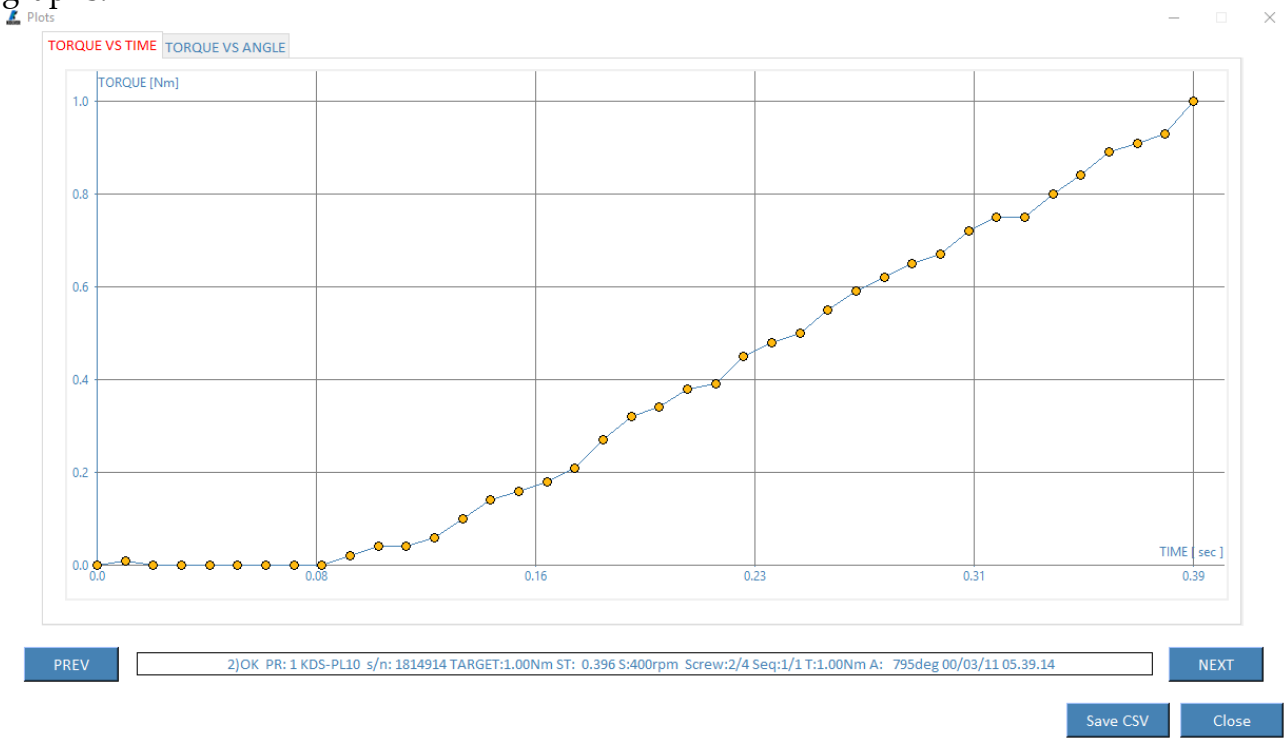
Press to recall a file previously saved on a PC with K-Expand or on a USB key directly on the K-DUCER. Once the file is selected, the parameters will be loaded automatically on K-Expand.

Open Terminal

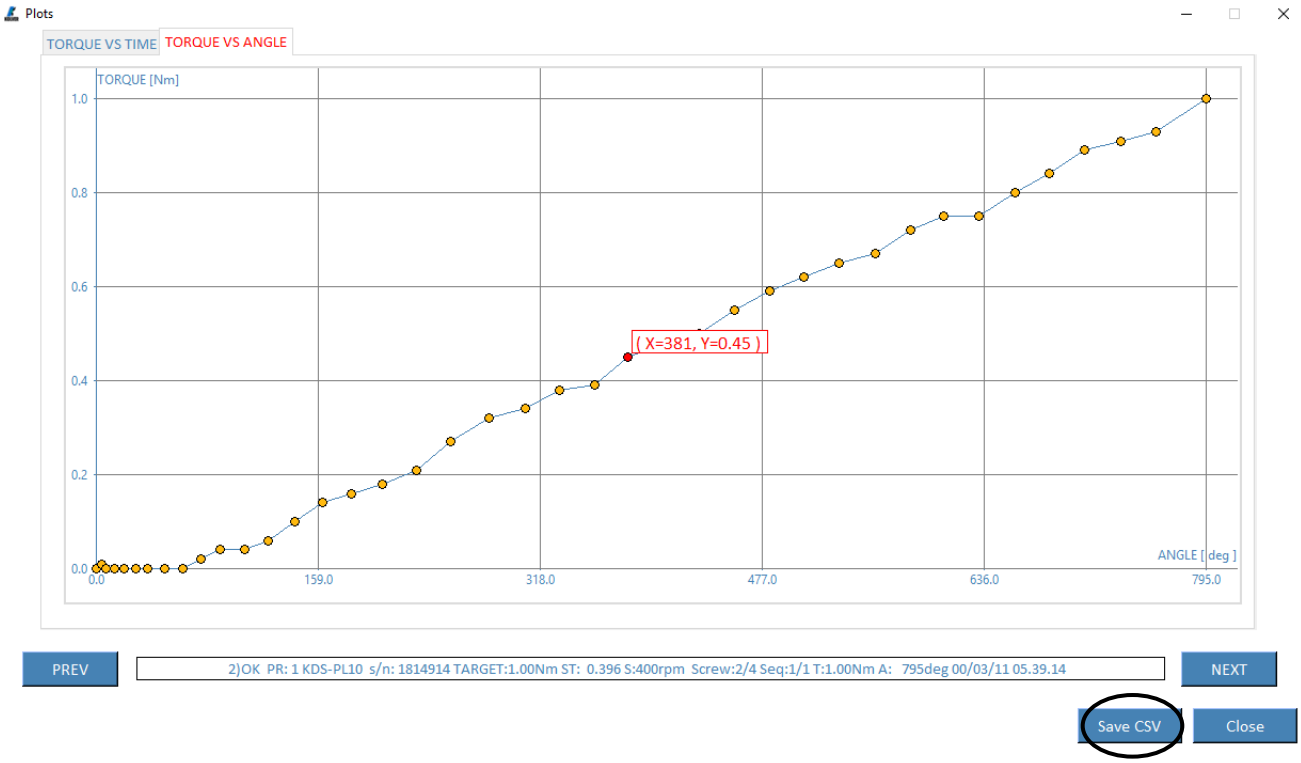
Press to display the print string and the status of the inputs/outputs in the KDU unit.
By selecting the ethernet-MODBUS TCP interface, it is also possible to test the remote control via ethernet, in particular Start (LEVER), Reverse, Stop Motor, OK, Reset, ESC.



Also, by pressing the SHOW CHARTS bar, you can view the torque-time and torque-angle graphs.



The graphs show the values sampled during the screwing corresponding to the print string shown below them. Pressing on one of them with the mouse it is possible to visualize the x and y axis values. Also note that it is possible to move between the graphs of each rundown by pressing the right and left directional arrows.



Finally it is possible to export the graphs in .csv format by clicking on the Save CSV.

K-EXPAND can be downloaded for free at https://kolverusa.com/products-list/16-Industry-40-KDUCER-Series

REMOTE CONTROL INTERFACES

The K-DUCER unit supports the following data acquisition and remote-control interfaces to suit your automation and industry 4.0 needs:

- 24V I/O signals (CN3), providing:
  - remote control (START/STOP/REVERSE and program/sequence selection)
  - angle counting start for STARTING AT mode "Ext"
  - binary data acquisition (OK/NOK/READY/ERROR/END)

- MODBUS TCP via ethernet port (CN5), providing:
  - remote control (same functionality as 24V I/O except angle counting start)
  - binary data acquisition (OK/NOK/READY/ERROR/END)
  - full data acquisition of last screwdriving result including torque/angle graphs
  - ability to change any program/sequence/setting parameter

- OPEN PROTOCOL (OP) via ethernet port (CN5), providing:
  - partial remote control (enable/disable tool and program/sequence selection)
  - data acquisition of last screwdriving result
  - ability to change some program/sequence/serial number parameters
  - see Supported MIDs for more details

- Interface with K-EXPAND software via mini-USB or ethernet port, providing:
  - same functionality available through MODBUS TCP
  - easiest choice for programming of all programs/sequences/settings
  - not recommended for remote control of screwdriver other than testing
  - data acquisition and torque/angle graph visualization

Additionally, a printout of each screwdriving result can be accessed as follows:

- Through serial ports CN4 and CN2, for printing with Kolver printer accessory or receival with any serial terminal, automatically transmitted at the end of each rundown
- On a text file saved to a thumb drive connected to the USB type A port (the larger USB port), automatically generated and saved at the end of each rundown
- From a server or PC with a python script provided by Kolver (CN5 via ModBus)
- See Retrieving and storing the screwdriving results section

24V I/O

Introduction

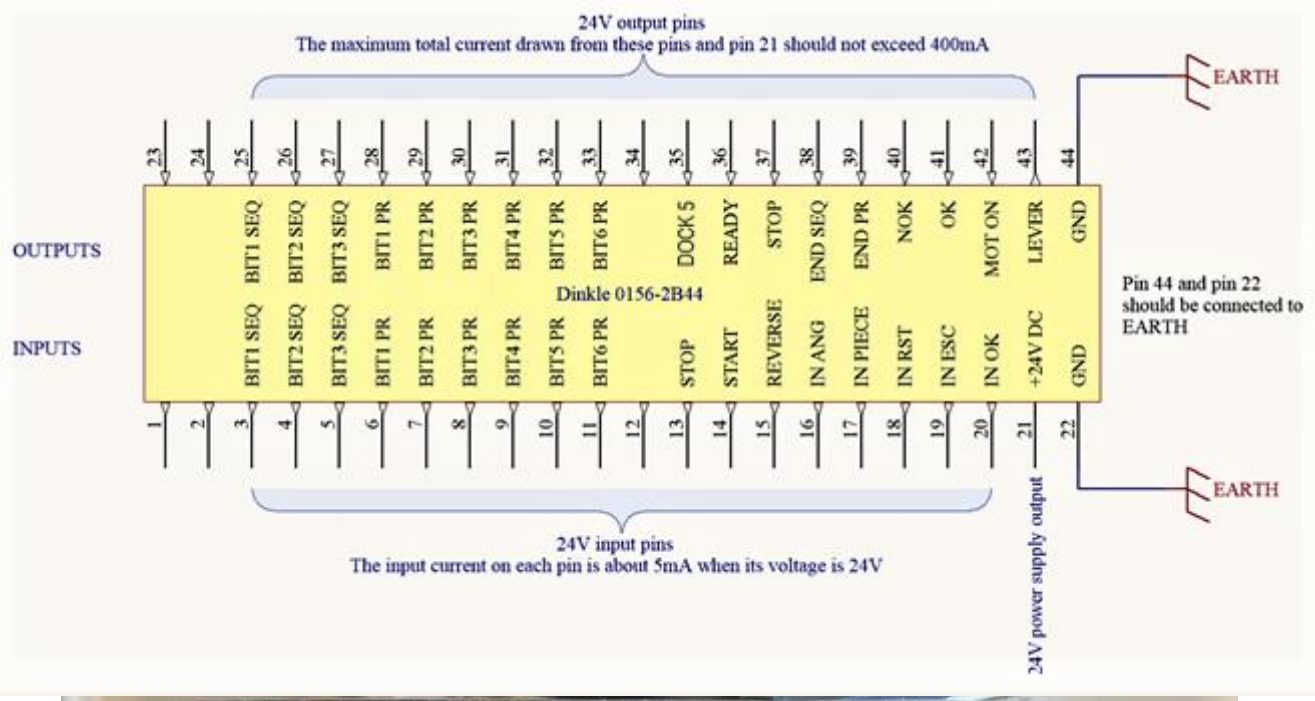
The 24V signals allow start/stop control of the screwdriver, program selection, sequence selection, error detection and clearing, and more.
The advantage of this system is the simplicity of the control, but its disadvantages are:

- Data acquisition capability is limited to OK / NOK signals and end program / end sequence signals. Torque and angle values cannot be read via these I/O signals.
- The 24V signals are susceptible to being disturbed by electromagnetic interference (EMI), especially in the highly noisy electrical environments often found in assembly lines. Kolver recommends using shielded wires with grounded shields and ferrite beads to limit EMI.

For these reasons, Kolver recommends using the more robust ethernet port with MODBUS TCP or Open Protocol whenever possible.
The I/O controls available via CN3 are:

- [I] Actuate the screwdriver motor (START)
- [I] Lock/disable the screwdriver (STOP / PIECE)
- [I] Program selection
- [I] Sequence selection
- [I] Error clearing (ESC)
- [I] Screw, program, or sequence reset (RST)
- [I] End Program / End Sequence acknowledgement (OK)
- [I] Angle counting start
- [O] OK/NOK result
- [O] READY status
- [O] End Program / End Sequence status
- [O] Screwdriver motor status

Pinout (CN3)



To connect, simply push the cable or the ferrule directly onto the corresponding hole.
To disconnect the cables, press lightly on the respective orange plate.

Solid cable section min (mm²) 0.2
Solid cable section max (mm²) 0.5
Section of braided cable min (mm²) 0.2
Section of braided cable max (mm²) 0.5
Flexible cable section with min ferrule without sheath (mm²) 0.25
Flexible cable section with max ferrule without sheath (mm²) 0.75
Flexible cable section with min ferrule with sheath (mm²) 0.25
Flexible cable section with max ferrule with sheath (mm²) 0.5

INPUT SIDE (PINS 1-22) The input signals must be driven by a +24VDC potential with respect to pin 22 (GND). A +24VDC potential is provided for convenience at pin 21 (24V DC). When driving the inputs via an automated machine or PLC, it is recommended to program a delay of at least 30ms between each change of input signals. Pulse signals (IN AGN, IN RST, ESC-EXT, OK-EXT) should be kept active for at least 30ms in order to be properly processed.		
PIN	**NAME**	**FUNCTION**
1	NOT USED	
2	NOT USED	
3	BIT1 SEQ	Least significant bit to select the Sequence (see charts below)
4	BIT2 SEQ	REMOTE SEQ setting (General Settings > REMOTE SEQ) must be ON to enable sequence selection via input pins 3-4-5
5	BIT3 SEQ	Most significant bit to select the Sequence (see binary tables below)
6	BIT1 PR	Least significant bit to select the Program (see binary tables below)
7	BIT2 PR	REMOTE PR setting (General Settings > REMOTE PR) must be ON to enable program selection via input pins 6-7-8-9-10-11
8	BIT3 PR	
9	BIT4 PR	
10	BIT5 PR	
11	BIT6 PR	Most significant bit to select the Program (see binary tables below)
12	NOT USED	
13	STOP MOTOR	Remote motor stop. When active, the screwdriver stops running and remains disabled. The message “STOP MOTOR ON” appears on the display. This signal disables the screwdriver and is prioritized over any other signal: START and REVERSE signals as well as the physical lever on the screwdriver will be ignored when STOP MOTOR is active.
14	START	Remote motor start. This pin serves the same function as the physical lever on the screwdriver. Activating it initiates the screwdriver motor. The signal must be maintained active for the motor to continue running. The motor will continue running until this signal is removed or until the rundown completes according to the current program parameters (for example, when reaching torque). As soon as the rundown completes, the screwdriver motor stops and this signal will be ignored until it is pulled down (for a recommended minimum of 30ms).
15	REVERSE	Remote motor reverse start.

		This pin serves the same function as the physical reverse button on the screwdriver. The behavior of the reverse button can be configured via General Settings > REVERSE BUTTON.
16	IN ANG	Input signal to initiate the angle measurement during a rundown, when using the external signal setting for angle measurement. See PROGRAM menu > TORQUE & ANGLE > STARTING AT for more details.
17	MISSING PIECE	Same function as pin 13 "STOP MOTOR", except "Error missing piece" is displayed on the status bar. Typically used in conjunction with a proximity sensor or other part detection mechanism.
18	IN RST	This signal serves the same function as the RESET button on the touch screen. The behavior of the RESET button can be configured via General Settings > RESET TYPE. CMD OK-ESC-RESET must be set to EXT or to INT+EXT to enable using this pin (General Settings > CMD OK-ESC-RESET).
19	ESC EXT	This signal serves the same function as the ESC button on the touch screen, to acknowledge and reset errors. Use in conjunction with the PRESS ESC setting on PROGRAMS menu > OTHER > PRESS ESC. CMD OK-ESC-RESET must be set to EXT or to INT+EXT to enable using this pin (General Settings > CMD OK-ESC-RESET).
20	OK EXT	This signal serves the same function as the ESC button on the touch screen, to acknowledge end of program status. Use in conjunction with the PRESS OK setting on PROGRAMS menu > OTHER > PRESS OK. CMD OK-ESC-RESET must be set to EXT or to INT+EXT to enable using this pin (General Settings > CMD OK-ESC-RESET).
21	24 VDC	Must not be used to power external devices +24V with respect to pin 22 (GND), voltage protected. The maximum current consumption is 400mA. This pin is provided for convenience as a source to activate the input signals. For example, in a typical PLC output terminal block, one can connect the COM(+) pin of the terminal block to this 24VDC source to power the PLC output signals.
22	GND	Common ground for all inputs and outputs, in parallel with pin 44. The input signals must be driven by a +24V potential with respect to this pin (GND). When using an external 24V source to drive the inputs, the negative terminal of the external source must be connected to this pin.

OUTPUT SIDE (PINS 23-44) The output signals are driven by a +24VDC potential with respect to pin 44 (GND), voltage protected, with a maximum current draw of 400mA. In a typical PLC input terminal block, the COM(-) pin of the terminal block should be connected to GND pin 44. The output signals READY, END SEQ, END PR, NOK, and OK, remain active until the screwdriver changes state again, for example, when the operator or the PLC initiates another rundown.		
PIN	**NAME**	**FUNCTION**
23	NOT USED	
24	NOT USED	
25	BIT1 SEQ	Least significant bit indicating currently selected sequence.
26	BIT2 SEQ	(see binary tables below)
27	BIT3 SEQ	Most significant bit indicating currently selected sequence.
28	BIT1 PR	Least significant bit indicating currently selected program.
29	BIT2 PR	(see binary tables below)
30	BIT3 PR	Note: pins 28-33 will blink when using Kolver CBS or SBX accessories or REMOTE PR with SEQUENCE toggle active.
31	BIT4 PR	
32	BIT5 PR	
33	BIT6 PR	Most significant bit indicating currently selected program.
34	NOT USED	
35	DOCK05	Mirrors 'BIT6 PR', for use with DOCK05 dual screwdriver accessory. This pin does not blink when using Kolver CBS or SBX accessories or REMOTE PR with SEQUENCE toggle active. v34 and later only.
36	READY	This signal is active when the screwdriver is in stand-by, ready to receive the START or REVERSE input commands.
37	STOP	This signal is active when the screwdriver is in STOP MOTOR state. Note that entering the configuration menu on the touch screen puts the screwdriver in the STOP MOTOR state.
38	END SEQ	This signal is active when the currently selected sequence completes, in other words, when the last screw of the last program in the sequence is tightened successfully (with OK result). This signal remains active until the screwdriver changes state again, for example, when the operator or the PLC initiates another rundown.
39	END PR	This signal is active when the currently selected program completes, in other words, when the last screw of the program is tightened successfully (with OK result). This signal will not activate if the "number of screws" setting of the program is zero.

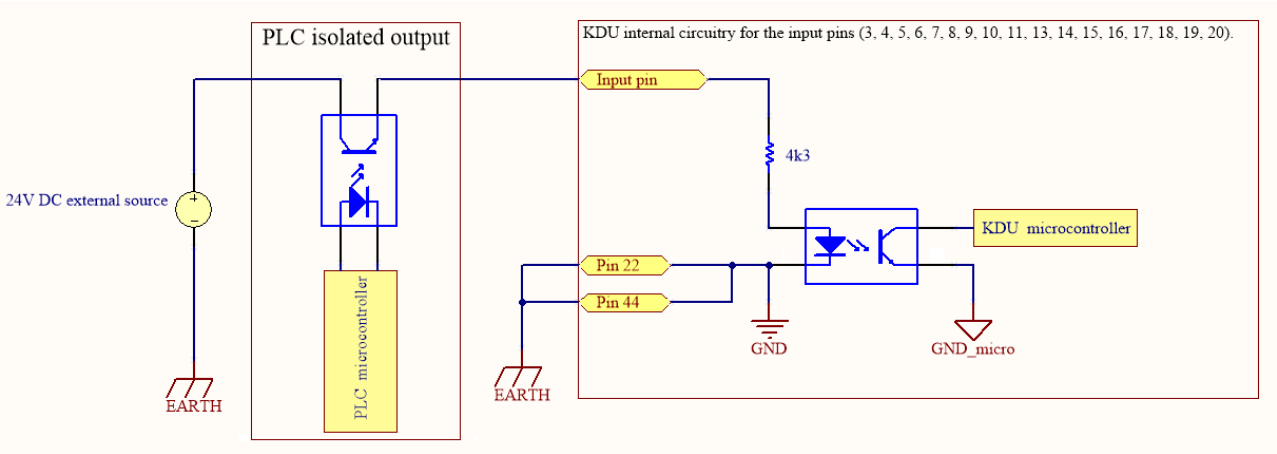
40	NOK	(Not-OK) This signal activates when the rundown (screw) completes unsuccessfully, outside of the parameters set for the current program, for example: torque reached under minimum time, torque reached outside angle bounds, etc. This signal remains active until the screwdriver changes state again, for example, when the operator or the PLC initiates another rundown.
41	OK	This signal activates when the rundown (screw) completes unsuccessfully, outside of the parameters set for the current program, for example: torque reached under minimum time, torque reached outside angle bounds, etc.
42	MOTOR ON (/W)	It activates when the screwdriver motor is running.
43	LEVER	It activates when the screwdriver lever is pressed.
44	GND	Common ground for all inputs and outputs, in parallel with pin 22. The 24V output signals must be taken between the output pin of interest and this ground pin. In a typical PLC input terminal block, the COM(-) pin of the terminal block should be connected to GND pin 44.

Wiring diagrams

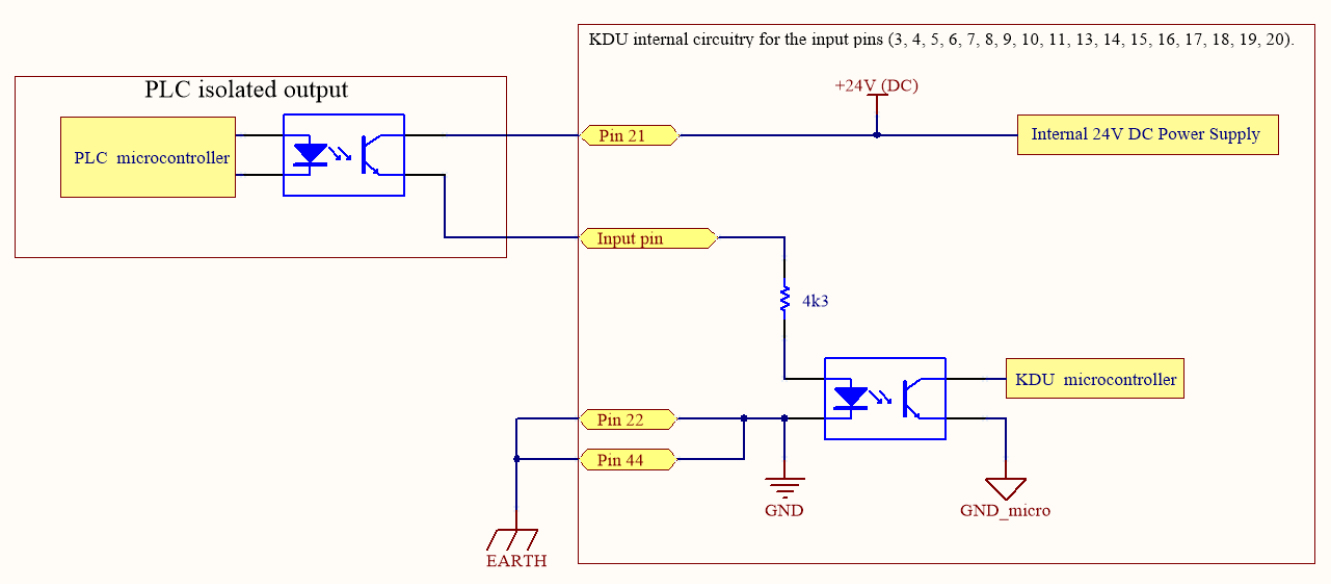
Inputs (pins 1-20)

All inputs (Pins 1 to 20) of the CN3 connector require a 24V DC positive signal. The signals can be powered via an external 24VDC source, in which case the negative terminal of the source should be connected to pin 22, or via pin 21 (internal 24VDC), in which case the contact can be controlled with opto-isolator, relay or button to activate the desired input.

Example on how to enable Input signals using an external source:

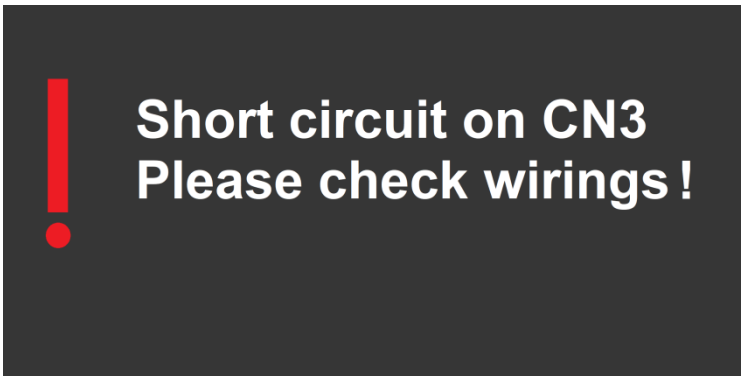


Example on how to enable Input signals using the internal tension on Pin 21:

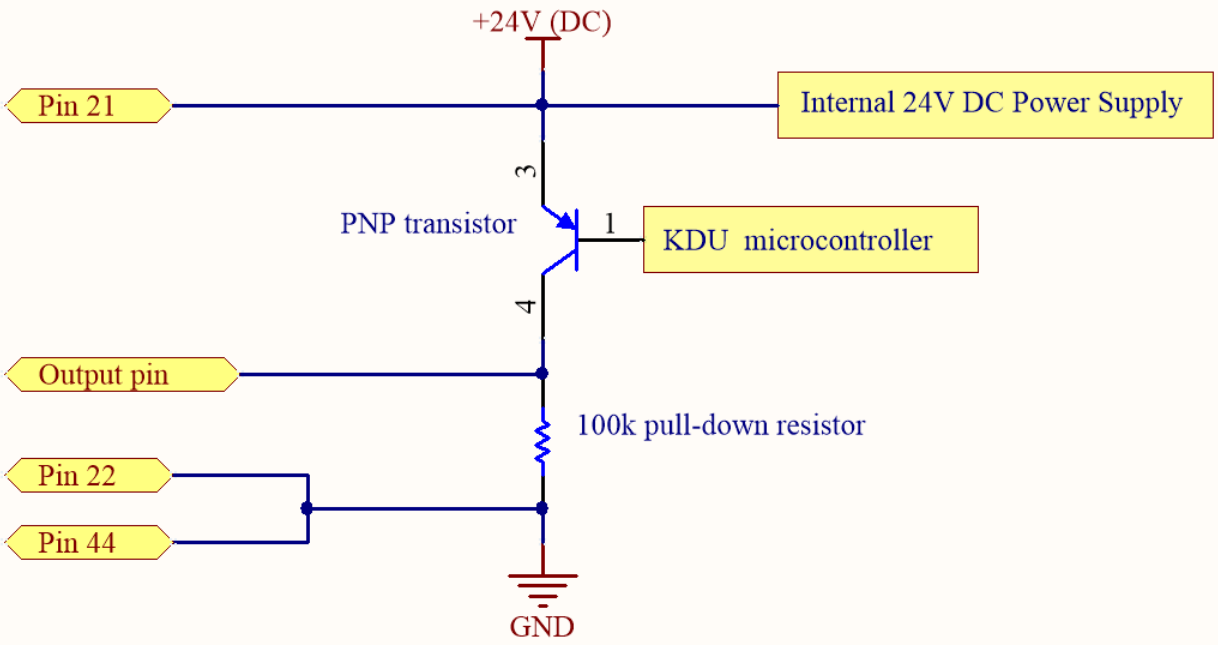


Outputs (pins 23-43)

When active, an output pin will provide a 24V DC signal on the respective pins with respect to ground pins 22/44. The signals can be used to activate LEDs / sensors or read directly from an external PLC. In this case the negative terminal of the KDU unit (pins 22 / 44) must be connected with the negative terminal of the PLC terminal block. The total power of the output signals is Max 400mA; if exceeded, a protection circuit deactivates the output signals and activates an alarm on the display (see figure below). The alarm signal remains active until the power draw drops below the 400mA threshold, which is checked every 2 seconds.



KDU internal circuitry for the output pins (25, 26, 27, 28, 29, 30, 31, 32, 33, 37, 38, 39, 40, 41, 42, 43).



Binary tables for sequence and program selection

Refer to the tables below for sequence or program selection via CN3, where "1" refers to an active +24VDC signal with respect to the GND pin and "0" refers to no signal.
The REMOTE PR or REMOTE SEQ setting (General Settings > REMOTE PR and REMOTE SEQ) must be active for the input selection to work.
The outputs pins 25-33 will always be active irrespective of the REMOTE PR/SEQ setting, following the same binary code pattern for the input side reported below.

Sequence	BIT3 SEQ PIN 5	BIT2 SEQ PIN 4	BIT1 SEQ PIN 3
-	0	0	0
A	0	0	1
B	0	1	0
C	0	1	1
D	1	0	0
E	1	0	1
F	1	1	0
G	1	1	1
H	Not Selectable		

PR #	BIT6PR PIN11	BIT5PR PIN10	BIT4PR PIN9	BIT3PR PIN8	BIT2PR PIN7	BIT1PR PIN 6		PR #	BIT6PR PIN11	BIT5PR PIN10	BIT4PR PIN9	BIT3PR PIN8	BIT2PR PIN7	BIT1PR PIN 6
-	0	0	0	0	0	0		**32**	1	0	0	0	0	0
1	0	0	0	0	0	1		**33**	1	0	0	0	0	1
2	0	0	0	0	1	0		**34**	1	0	0	0	1	0
3	0	0	0	0	1	1		**35**	1	0	0	0	1	1
4	0	0	0	1	0	0		**36**	1	0	0	1	0	0
5	0	0	0	1	0	1		**37**	1	0	0	1	0	1
6	0	0	0	1	1	0		**38**	1	0	0	1	1	0
7	0	0	0	1	1	1		**39**	1	0	0	1	1	1
8	0	0	1	0	0	0		**40**	1	0	1	0	0	0
9	0	0	1	0	0	1		**41**	1	0	1	0	0	1
10	0	0	1	0	1	0		**42**	1	0	1	0	1	0
11	0	0	1	0	1	1		**43**	1	0	1	0	1	1
12	0	0	1	1	0	0		**44**	1	0	1	1	0	0
13	0	0	1	1	0	1		**45**	1	0	1	1	0	1
14	0	0	1	1	1	0		**46**	1	0	1	1	1	0
15	0	0	1	1	1	1		**47**	1	0	1	1	1	1
16	0	1	0	0	0	0		**48**	1	1	0	0	0	0
17	0	1	0	0	0	1		**49**	1	1	0	0	0	1
18	0	1	0	0	1	0		**50**	1	1	0	0	1	0
19	0	1	0	0	1	1		**51**	1	1	0	0	1	1
20	0	1	0	1	0	0		**52**	1	1	0	1	0	0
21	0	1	0	1	0	1		**53**	1	1	0	1	0	1
22	0	1	0	1	1	0		**54**	1	1	0	1	1	0
23	0	1	0	1	1	1		**55**	1	1	0	1	1	1
24	0	1	1	0	0	0		**56**	1	1	1	0	0	0
25	0	1	1	0	0	1		**57**	1	1	1	0	0	1
26	0	1	1	0	1	0		**58**	1	1	1	0	1	0
27	0	1	1	0	1	1		**59**	1	1	1	0	1	1
28	0	1	1	1	0	0		**60**	1	1	1	1	0	0
29	0	1	1	1	0	1		**61**	1	1	1	1	0	1
30	0	1	1	1	1	0		**62**	1	1	1	1	1	0
31	0	1	1	1	1	1		**63**	1	1	1	1	1	1
PR #	**BIT6PR PIN11**	**BIT5PR PIN10**	**BIT4PR PIN9**	**BIT3PR PIN8**	**BIT2PR PIN7**	**BIT1PR PIN 6**		**PR #**	**BIT6PR PIN11**	**BIT5PR PIN10**	**BIT4PR PIN9**	**BIT3PR PIN8**	**BIT2PR PIN7**	**BIT1PR PIN 6**

Note: for safety reasons, Kolver has chosen not to associate any program or sequence if no input is activate. This makes sequence H and program 64 not selectable via CN3 inputs. It is still possible to select sequence H or program 64 manually, with Kolver accessories, or via one of the communication protocols.

MODBUS TCP

Note: the full K-DUCER MODBUS Map along with several code examples, guides, and literature can be found at: at https://kolverusa.com/products-list/16-Industry-40-KDUCER-Series

Introduction

The recommended way to interface with the K-DUCER unit is through the MODBUS TCP protocol on the ethernet port (CN5).
MODBUS communication protocol provides a Client-Server interface between devices connected on an ethernet TCP/IP network.
The MODBUS protocol specifications are open source and freely available online at modbus.org, however most automation engineers will not need to worry about the implementation details because MODBUS is already supported and implemented by most ethernet-capable PLCs and industrial PCs.

Usage

Enable MODBUS TCP via the General Settings menu > COMMUNICATION PROTOCOL.
The K-DUCER should be connected to the same LAN network as the controlling device, and it must be left in the main operation screen, outside of any configuration menu.
Note: the K-DUCER will respond to the *ping* command over TCP/IP when configured correctly.

The K-DUCER implements a MODBUS server, which responds to MODBUS requests.
The automation device (PLC, industrial PC, …) must implement a MODBUS client, which sends MODBUS requests to the server (K-DUCER).

The MODBUS server (K-DUCER) only responds to requests and never initiates any communication independently, in accordance with the MODBUS protocol.
A MODBUS request is simply a message requesting to read or write one or more *bits* or *bytes* of data at a particular address. The list of all accessible data and their addresses is called the MODBUS map.

MODBUS requests are categorized into *function codes*. Different function codes are used to access different types of data (bits-coils or byes-registers). There are also convenience function codes used to access a range of multiple data addresses at once.

All program, sequence, and general settings can be modified via MODBUS requests. However, Kolver recommends pre-configuring the K-DUCER programs and settings via the K-Expand software, via touch screen, or via kdu backup file from USB, and only

utilizing the MODBUS TCP protocol for screwdriver control, program switching, and data acquisition.

Changing program parameters such as target torque via MODBUS is possible, but it shouldn't be necessary except for the rare applications requiring more than 64 different programs.

K-DUCER MODBUS map

The K-DUCER, MODBUS data is organized and accessed as follows:

Data Category	Contents	Access	Associated MODBUS function codes
COILS (*bits*)	A mirror copy of the CN3 output pins 23 to 43 represented as bits; Writeable coils mimicking the functionality of CN3 input pins 13 to 20, providing screwdriver motor control capability	Read/ Write	01 (read coils) 05 (write single coil) 15 (write multiple coils)
INPUT REGISTERS (*bytes*)	Data related to the last screwdriving results including closing torque and angle; torque/angle charts; current screwdriving state and errors; connected screwdriver info	Read only	04 (read input registers)
HOLDING REGISTERS (*bytes*)	Current selected program; Remote programming mode enter/exit flag; All program settings; All sequence setting; Current selected sequence; All options settings.	Read/ Write*	03 (read holding registers) 06 (write single register) 16 (write multiple registers)
DISCRETE INPUTS	A mirror copy of the CN3 input pins 1 to 20 represented as bits	Read only	

*__Note__: all holding registers except *CurrentProgram* (7373) can only be written after entering Remote Programming Mode. These registers contain all program, sequence, and option

settings. It is possible but not recommended to change these parameters via MODBUS. To modify holding registers via MODBUS, follow these steps:

- Write the value “1” to address 7790 to enter “Remote Programming Mode” using MODBUS function code 06 “write single register”
- Change the desired holding register values using MODBUS function codes 06 or 16
- Write the value “2” to address 7790 to apply the changes and exit “Remote Programming Mode”

The full MODBUS map can be found at https://kolverusa.com/products-list/16-Industry-40-KDUCER-Series

MODBUS TCP code examples and literature

We provide sample projects illustrating K-DUCER screwdriver control built by Kolver for various devices, as well as generic MODBUS TCP guides and literature produced by the manufacturers of these devices at https://kolverusa.com/products-list/16-Industry-40-KDUCER-Series

The packet also contains some example configuration files for the Anybus gateway protocol converters (see PROFINET / Ethernet IP / EtherCAT / others)

We also recommend searching youtube for a multitude of freely available videos illustrating how to implement MODBUS TCP communication with various control systems.

Anybus, Rockwell, Allen Bradley, MicroPLC, ControlLogix, CompactLogix, Siemens, SIMATIC, Universal Robots, PolyScope, are all trademarks of their respective corporations and are not affiliated with Kolver.

OPEN PROTOCOL

Introduction

The K-DUCER control unit supports a subset of the Open Protocol communication interface, based on the Open Protocol specification release 1.6, revision 3.
The Open Protocol communication interface gives the K-DUCER plug-and-play compatibility with any MES software (Manufacturing Execution System) that supports Open Protocol 1.6 rev3.
Enable Open Protocol via the General Settings menu > COMMUNICATION PROTOCOL, selecting "OP". OP works on TCP/IP port 4545, one connection at a time.

Terminology

Open Protocol	K-DUCER
Pset (Parameter set)	Program (numbered 1 through 64)
Batch size	Number of screws (configured for each program, default 1, max 99)
Job	Sequence of up to 16 programs. Sequences are identified as letters in the KDucer unit, but as numbers (Job IDs) within the context of Open Protocol. A=1, B=2, C=3, D=4, E=5, F=6, G=7, H=8
VIN	Barcode (for barcode mode "on S/N" only)

Supported MIDs

MID	Description	Revision(s)	Sent by	Response MID
0001	Communication Start	001	Integrator	0002 or 0004
0002	Communication Start Acknowledge	001	Controller	None
0003	Communication Stop	001	Integrator	0005
0004	Command Error	001	Controller	None
0005	Command Accepted	001	Controller	None
0010	Pset Id upload request	001	Integrator	0011
0011	Pset Id upload reply	001	Controller	None
0012	Pset data upload request	001	Integrator	0013 or 0004
0013	Pset data upload reply	001	Controller	None
0014	Pset selected subscribe	001, 002	Integrator	0005 and 0015
0015	Pset selected	001, 002	Controller	0016
0016	Pset selected acknowledge	001	Integrator	None
0017	Pset selected unsubscribe	001	Integrator	0005 or 0004
0018	Select Pset	001	Integrator	0005 or 0004
0019	Set Batch Size	001	Integrator	0005 or 0004
0020	Reset Batch Counter	001	Integrator	0005 or 0004
0030	Job ID upload request	001	Integrator	0031
0031	Job ID upload reply	001	Controller	None

0032	Job data upload request	001	Integrator	0033 or 0004
0033	Job data upload reply	001	Controller	None
0034	Job info subscribe	001	Integrator	0005 or 0004
0035	Job info	001	Controller	None or 0036
0036	Job info acknowledge	001	Integrator	None
0037	Job info unsubscribe	001	Integrator	0005 or 0004
0038	Select Job	001	Integrator	0005 or 0004
0039	Job restart	001	Integrator	0005 or 0004
0042	Disable tool	001	Integrator	0005
0043	Enable tool	001	Integrator	0005
0050	Vehicle ID Number download request	001	Integrator	0005 or 0004
0051	Vehicle ID Number subscribe	001	Integrator	0005 or 0004
0052	Vehicle ID Number	001	Controller	0053
0053	Vehicle ID Number Acknowledge	001	Integrator	None
0054	Vehicle ID Number Unsubscribe	001	Integrator	0005 or 0004
0060	Last tightening result data subscribe	001, 002	Integrator	0005 or 0004
0061	Last tightening result data	001, 002	Controller	None or 0062
0062	Last tightening result data acknowledge	001, 002	Integrator	None
0063	Last tightening result data unsubscribe	001, 002	Integrator	0005 or 0004
0070	Alarm subscribe	001	Integrator	0005 or 0004
0071	Alarm	001	Controller	None or 0072
0072	Alarm acknowledge	001	Integrator	None
0073	Alarm unsubscribe	001	Integrator	0005 or 0004
MID	**Description**	**Revision(s)**	**Sent by**	**Response MID**

PROFINET / Ethernet IP / EtherCAT / others

Most PLCs are capable of communication via MODBUS TCP and come with ready-to-use MODBUS TCP libraries.
Kolver provides example projects for remote control and data acquisition of the K-DUCER via MODBUS TCP for Siemens (S7-1200) and AllenBradley (Micro800 series) PLCs.
For those customers requiring or preferring to communicate or control the K-DUCER directly using other communication protocols such as PROFINET, Ethernet IP, or EtherCAT, Kolver recommends purchasing a protocol converter such as anybus gateway with “ModBus TCP Client” as the first network interface, and the interface of your choice for the second.
Kolver is not affiliated with Anybus and can only provide limited support in configuring these products. Some configuration examples and files are included in the MODBUS TCP code examples and literature packet.
Anybus, Rockwell, Allen Bradley, MicroPLC, ControlLogix, CompactLogix, Siemens, SIMATIC, Universal Robots, PolyScope, are all trademarks of their respective corporations and are not affiliated with Kolver.

MAINTENANCE AND CARE

INTRODUCTION

K-DUCER and KDS screwdrivers are precision tools. While built to withstand heavy use in industrial environments, good care and proper maintenance will go a long way in ensuring the best performance and lifetime of your instrument.

Make sure to follow the INSTALLATION instructions for the K-DUCER, KDS screwdriver, and the reaction arm.

The most important factor in ensuring long-lasting performance and lifetime of the instrument is to configure it properly for the job required. Read this manual carefully to ensure the tool is optimally configured for your application.

Some factors that can overwork and overheat the screwdriver include:

- Combination of high torque and low speed on very elastic joints (note that the screwdriver delivers high torques more efficiently at higher speeds)
- Very high duty cycles (< 3 seconds between rundowns), depending on the difficulty (torque, elasticity, speed) of the rundown
- High torques are defined as above 80% of the maximum nominal torque for the KDS screwdriver model. Consider upsizing to a higher-torque screwdriver model if most of your cycles are above 80% of the maximum nominal torque.

CALIBRATION

Recommended calibration interval: every 1,000,000 cycles. See TOOL INFO to check the number of cycles of your KDS screwdriver.

Kolver supplies all KDS series screwdrivers with the transducer pre-calibrated on a semi-elastic joint at a final speed of 100RPM (KDS models 15Nm and smaller) or 50RPM (KDS models 20Nm and larger). The calibration settings are unique to each KDS screwdriver and saved on the KDS screwdriver board.

Contact your Kolver representative to schedule a maintenance and calibration service with Kolver or through one of our ISO/NIST certified lab partners.
Alternatively, Kolver can provide calibration instructions for you to perform the calibration in-house.

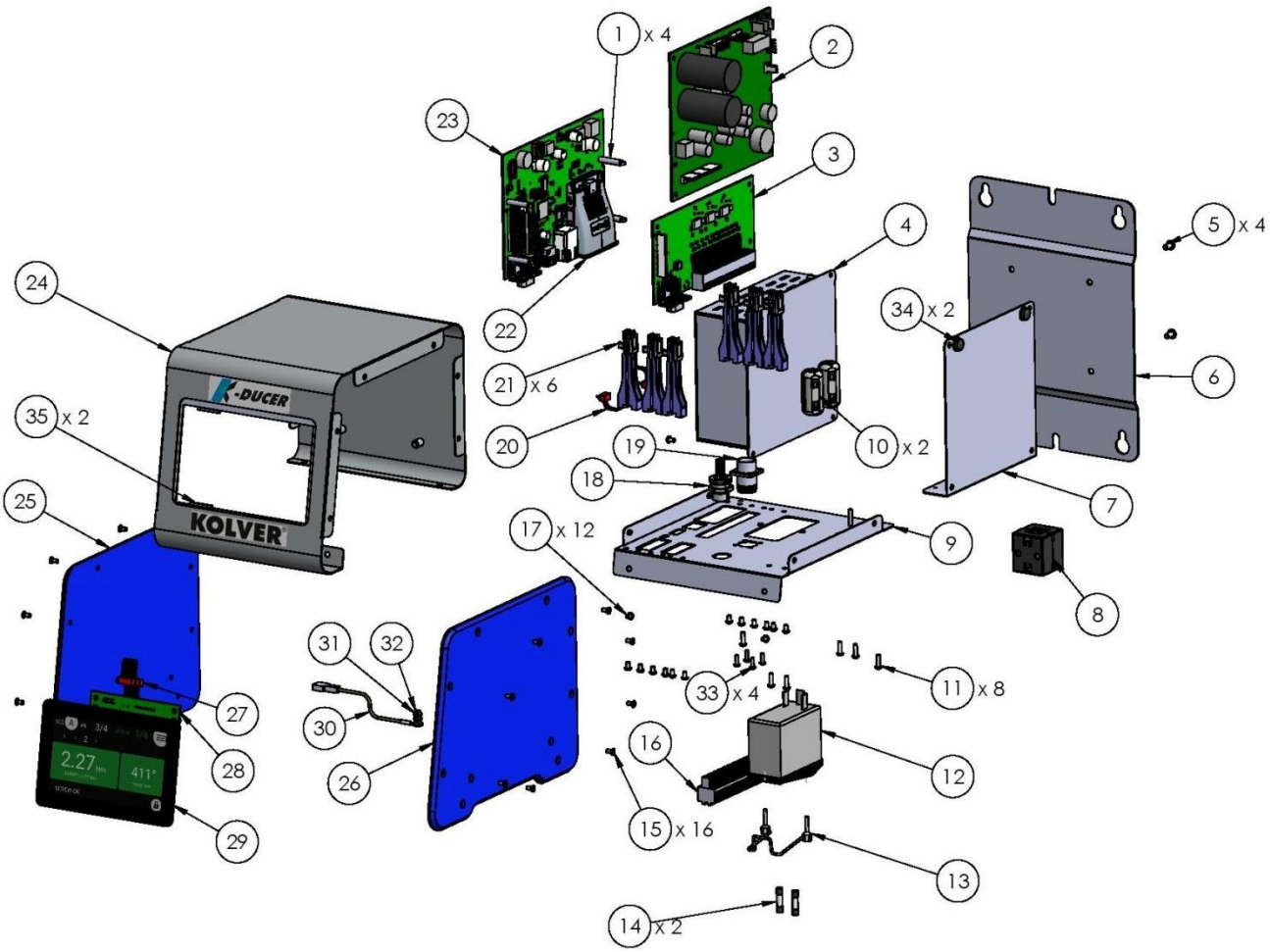
MAINTENANCE

Recommended maintenance interval: every 500,000 cycles or 12 months, whichever comes first. See TOOL INFO to check the number of cycles of your KDS screwdriver.

Maintenance consists of disassembling the screwdriver to clean and relubricate the gearbox, and checking the calibration of the screwdriver against a certified torque measurement tool. Contact your Kolver representative to schedule a maintenance service. Alternatively, Kolver can provide maintenance instructions.

EXPLODED VIEWS AND SPARE PARTS

EXPLODED VIEW KDU-1A:



SPARE PARTS KDU-1A:

Position	Description	Quantity	Part Number
1	SPACER 22MM KDU	4	872522
2	MOTOR BOARD K-DUCER	1	852530
3	I/O BOARD (44 PIN CONNECTOR) - KDU	1	852533/B
4	SWITCHING	1	872490
5	SCREW M4X8 ZN TX20	4	872534
6	SIDE PLATE	1	872504
7	SUPPORT SWITCHING PLATE KDU	1	872505
8	FERRITE RKCF-08-A5	1	872468
9	BOARDS SEAT	1	872503/A
10	FERRITE SCREWDRIVER CONNECTOR	2	872523
11	SCREW M3X10 ZN TX10	6	231530
12	FILTER AR13.6 A	1	800718
13	ANTI-UNTHREAD PLUGS	1	800719
14	FUSE 3,15A F-520LT3.15	2	800619
15	SCREW TSP M3X8 TX10 ZN	16	801009
16	CONNECTOR I/O 44PIN	1	872526
17	SCREW M3 X 5 ZN TX10	18	872444
18	CONNECTOR M12 8 POLI FEMALE	1	872537
19	CONNECTOR M16 10 PIN FEMALE	1	201668/HU
20	FLAT CABLE 4 PIN	1	872539
21	SUPPORT MOTOR BOARD	6	872442
22	ANYBUS	1	872521
23	I/O (MICRO) BOARD	1	852533/A
24	FRONT PANEL	1	872502
25	LEFT SIDE KDU	1	872500
26	RIGHT SIDE KDU	1	872501
27	FLAT CABLE 8 PIN + FERRITE	1	872540
28	FTDI DISPLAY TOUCH BOARD	1	852529
29	DISPLAY TOUCH 5" DLC0500HZR-T-17	1	852532
30	GROUND CABLE	1	800090/E
31	WASHER M3	3	800041
32	M3 BRUSSER NUT	3	800056/O
33	SCREW M2,5X8 ZN TX10	4	872478
34	RUBBER SUPPORT	2	800016
35	GASKET	2	872524
	LABEL	1	818006/SW
	CABLE 3x0,75 H05VVF 2mt. SCHUKO	1	800620

GUARANTEE

This KOLVER product is guaranteed against defective workmanship or materials, for a maximum period of 12 months following the date of purchase from KOLVER, provided that its usage is limited to single shift operation throughout that period. If the usage rate exceeds of single shift operation, the guarantee period shall be reduced on a prorata basis.
If, during the guarantee period, the product appears to be defective in workmanship or materials, it should be returned to KOLVER or its distributors, transport prepaied, together with a short description of the alleged defect. KOLVER shall, at its sole discretion, arrange to repair or replace free of charge such items.
This guarantee does not cover repair or replacement required as a consequence of products which have been abused, misused or modified, or which have been repaired using not original KOLVER spare parts or by not authorized service personnel.
KOLVER accepts no claim for labour or other expenditure made upon defective products. Any direct, incidental or consequential damages whatsoever arising from any defect are expressly excluded.
This guarantee replaces all other guarantees, or conditions, expressed or implied, regarding the quality, the marketability or the fitness for any particular purpose.
No one, whether an agent, servant or employee of KOLVER, is authorized to add to or modify the terms of this limited guarantee in any way. However it's possible to extend the warranty with an extra cost. Further information at kolver@kolver.it.